2858
#32

Patent and Trademark Office
Commissioner of Patents and Trademarks
Washington, DC 20231

1 November, 2002
Re:
William H. Swain, inventor
Error Correction by Selective Modulation
SN 08/579,395; Filed 12/27/95; Art 2213
Group 2858
703-308-5222, or 305-4900
Primary Examiner: Mr. Ernest F. Karlsen

Subject: Response to the Examiner's action mailed 25 September 2002.

William H. Swain 11-1-02

1. Summary:

The examiner's rejection of claims 32-66 under 35 U.S.C. 102(b) is improper because the claims of Swain 1995 are patentably distinguishable from the prior art. The elements are not taught or implied in the cited references, even when Swain 1970 is improperly combined with Lee, Moser et al, Hubbard, and Sweeny. Improperly because they are not analogous, nor are they pertinent. Moreover, none motivates to combine with another. The MPEP 706.02(a) requirement has not been met.

DISTINCTION BETWEEN 35 U.S.C. 102 AND 103

> The distinction between rejections based on 35 U.S.C. 102 and those based on 35 U.S.C. 103 should be kept in mind. Under the former, the claim is anticipated by the reference. No question of obviousness is present. In other words, for anticipation under 35 U.S.C. 102, the reference must teach every aspect of the claimed invention either explicitly or impliedly. Any feature not directly taught must be inherently present.

The "basic concept" is included in the first two paragraphs of the 1995 abstract.

> (h) Abstract of the Disclosure.
>
> The accuracy of certain sensors is greatly improved by improving their signal to noise ratio (SNR) in the presence of an interfering noise. Sensors were discovered which have a SNR which substantially changes when an operating parameter is selectively modulated to different magnitudes. Some noise can be practically eliminated. In the simplest form, the sensor is operated where it is both stable and close to its best SNR. This is usually faster and less costly, but the noise is never completely eliminated.

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Often, the method involves operating the sensor in first one state and then another wherein the operating parameter has conditions where the sensor is stable, reproducible, and reliable, and wherein the SNRs are substantially different. output of a state is combined with the output of another state in such a way that the noise cancels but a signal remains. Often the output in a state having greater noise is attenuated until it matches the noise content of another state having less noise. Then these outputs are subtracted. The difference is the more accurate error corrected output. In the ideal case, the difference has no noise output because the noise in the output from one state canceled the noise in the output of the other state.

There are two elements or steps, in the "basic concept" included in some form or another in the generic claims 45, 63, 64, and 66; and for that matter, all claims 32-66:

a) A sensor having the Essential Characteristic that its SNR changes a lot when the Operating Parameter is modulated, and also

b) the sensor is operated to take advantage of the Essential Characteristic.

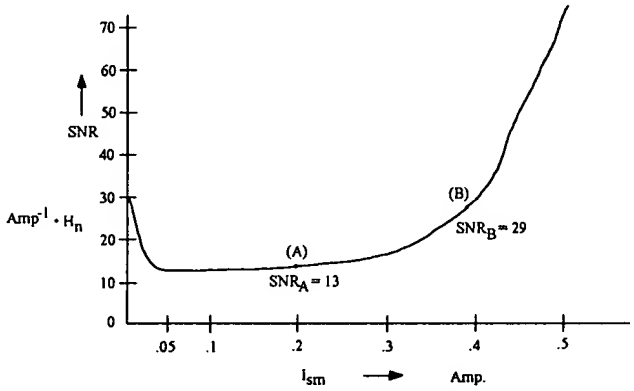

Figure 5
Signal to Noise Ratio (SNR) for Non-Uniform Field H_n
vs.
Operating Parameter I_{sm}
for
5" dia. aperture clip #88 in SN 2336

$$SNR = \frac{\frac{\delta V_{out}}{\delta I_{in}}}{\frac{\delta V_{out}}{\delta N}} \left\} \frac{\text{output}}{\text{noise}} \right.$$

$$= \frac{\text{gain}}{\text{gain} \cdot \frac{\delta O}{\delta N}} \quad \frac{Z}{g} = \text{equivalent input offset I per unit non-uniform field } H_n$$

In the better SNR species the magnitude of the operating parameter is set for the best practical result. This is point B on 1995 figure 5. In the combiner species the magnitude of the operating parameter may be modulated back and forth from point (A) to point (B). After suitable conditioning and combining the noise can be canceled.

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This two step method was contrary to the understandings of the art. MPEP 2141.02 states:

> THE CLAIMED INVENTION AS A WHOLE MUST BE CONSIDERED
>
> In determining the differences between the prior art and the claims, the question under 35 U.S.C. 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. *Stratoflex, Inc.* v. *Aeroquip* gapless support structure. "Because that insight was contrary to the understandings and expectations of the art, the structure effectuating it would not have been obvious to those skilled in the art." 218 USPQ at 700 (citations

I show that Swain 1970 taught careful and symmetrical construction of a sensor, but never implied this two step method. Even if the Essential Characteristic had been in Swain 1970 sensors, which is doubtful - the material was different - no one had figured out that the problem was zero offset error due to locally magnetized sectors in the pipe carrying the direct current to be measured. Moreover, no one taught how to solve the problem.

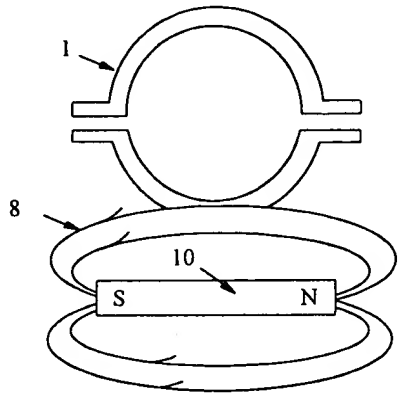

Fig. 3: A non-uniform magnetic field (H_n) 8 from a magnet acting on the core.

The invention included discovering that the problem, figure 3, was the non-uniform magnetic field, H_n, near the sensor's core (1). And then coming up with the two step solution. No cited reference, or combination, teaches every aspect of Swain 1995 in claims 32-66.

Contrary to the examiner's assertion, I never stated that I relied on any one single claim. Much less a canceled claim. It is the "basic concept" that I rely upon. Claim 14 was mentioned as an example. If I had wanted to rely on a single claim, I could have canceled claims 32-66, save for claim 45. I did not because the "basic concept" is in my claimed invention, claims 32-66.

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MPEP 2141.02 states: THE CLAIMED INVENTION AS A WHOLE MUST BE CONSIDERED

> In determining the differences between the prior art and the claims, the question under 35 U.S.C. 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. *Stratoflex, Inc.* v. *Aeroquip Corp.*, 713 F.2d 1530, 218 USPQ 871 (Fed. Cir. 1983); *Schenck* v. *Nortron Corp.*, 713 F.2d 782, 218 USPQ 698

I ask that my claimed invention be considered as a whole, especially generic claims 45, 63, 64, and 66.

2. In his section 2 the examiner writes:

> 2. By Applicant's admission if claim 45 is not patentable no claim of the present application is patentable.

This is not true. I rely on the "basic concept". That I did indeed rely on the basic concept - not some single claim - is shown by what I wrote on the first three pages, before any mention of canceled claim 14. Claim 14 was canceled on 24 March 2000.

I presented one aspect of the basic concept - figure 5 - on page one of my response dated 20 November 2001 and filed 18 December 2001. The Essential Characteristic, a unifying element, is present in every claim in one form or another.

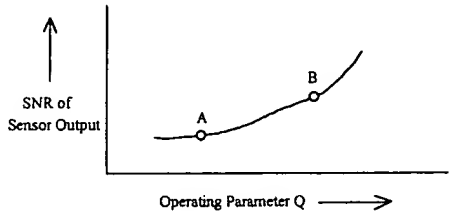

Figure 5 is an illustration of a sensor having the "Essential Characteristic".

I continued on Page 2:

The simplest is "better SNR".

With it we double or triple the accuracy of our clamp-on direct current ammeters when measuring a small current in the presence of noise in the form of a nearby magnet. We did this by operating our clamp-on sensor at point B instead of point A as we had done in the past. By the grace of God, operation at point B works a lot better, and reliably so, in many and diverse applications.

My original objective was to cancel noise. Conceptually, this was achieved by combining the outputs of two sensors, one operated at point A, and the other at point B in Figure 5. The noise

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output at A is 2 times that at B, but the signals are about equal. So when A is divided down to half, the noises are equal. The combiner subtracts ½ of A from B. The result is noise cancellation, but half the signal is still available for use - noise free.

Then I showed excerpts from three generic claims. Each includes the Essential Characteristic plus means for using it to improve accuracy by reducing error in the output of the sensor.

> Claim 45 is for a sensor having the **Essential Characteristic** together with means enabling it to substantially increase SNR in a machine, or independently.
>
> Claim 63 is for a machine including a sensor having the **Essential Characteristic** plus support means to considerably reduce (noise) interference ("better SNR species"), or to practically cancel (noise) interference ("combiner" species).
>
> Claim 66 is for a method for making a more accurate sensor with implement, including the **Essential Characteristic**, all fitted for reducing the sensitivity to (noise) interference ("better SNR species"), or to approximately cancel the (noise) interference (combiner species).

Finally, in the discussion, I quoted the examiner's statement of September 22, 1998, thusly:

> 1. Because Applicant has indicated that no patentably distinct inventions or species are present the Restriction Requirements of February 21, 1997 and January 16, 1998 are withdrawn. It is noted that Applicant states on page 1 (actually the second page) of the Amendment of May 29, 1997: "My traverse relies on the fact that the basic concept (claim 14) is in every claim, so no claim would be patentable over another because it would lack novelty outside of this application." (emphasis added)

Note that it is the "basic concept" - not canceled claim 14 - that I rely upon. Canceled claim 14 is an example of a generic claim. Present claim 45 is another example. So also are claims 63, 64, and 66.

3. I rely on the "Basic Concept" which appears in the claims, especially the generic claims.

On page 2100-8, MPEP 2106 states:

> Finally, when evaluating the scope of a claim, every limitation in the claim must be considered. Office personnel may not dissect a claimed invention into discrete elements and then evaluate the elements in isolation. Instead, the claim as a whole must be considered. See, e.g., *Diamond* v. *Diehr*, 450 U.S. at 188–89, 209 USPQ at 9 ("In determining the eligibility of respondents' claimed process for patent protection under 101, their claims must be considered as a whole. It is inappropriate to dissect the claims into old and new elements and then to ignore the presence of the old elements in the analysis.

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I ask that my claims be considered as a whole - all of them - not just claim 45. The novel two step basic concept will be found - in one form or another - in each claim.

5. References

Summary of Traverse of Cited References

The five cited references are considered individually. Taken singly or together they do not "fully anticipate" the claims because:

Lee, Moser, Hubbard, and Sweeny are not analogous to Swain 1995.
Lee, Moser, Hubbard, and Sweeny are not pertinent to Swain 1995.
Lee, Moser, Hubbard, and Sweeny do not motivate to combine with others or Swain 1970
Lee, Moser, Hubbard, and Sweeny do not have the teaching or structure of Swain 1995.
Swain 1970 lacks the structure of Swain 1995.
Swain 1970 lacks the teaching of why and how to use the "Essential Characteristic", so it would be useless even if present.
Swain 1995 discovered the problem of nearby magnet induced zero offset, and
Swain's 1995 "Discovery" of the special property in some sensors - the "Essential Characteristic", which enabled a solution to the problem.
Swain 1995 proceeded contrary to the accepted thinking in the art. Instead of just a single good sensor structure step, Swain 1995 used a two step method: 1) good sensor; and 2) selective modulation of the operating parameter to get a lot better SNR.

Therefore the five cited references do not fully anticipate the "basic concept" of the present 1995 invention or the four present generic claims 45, 63, 64, and 66 which include this "basic concept" as put forth in the "Discovery", the "Essential Characteristic", and the Abstract.

The Present Invention

Paragraph 1 of the 1995 Abstract describes the present invention in basic terms.

> (h) Abstract of the Disclosure.
>
> The accuracy of certain sensors is greatly improved by improving their signal to noise ratio (SNR) in the presence of an interfering noise. Sensors were discovered which have a SNR which substantially changes when an operating parameter is selectively modulated to different magnitudes. Some noise can be practically eliminated. In the simplest form, the sensor is operated where it is both stable and close to its best SNR. This is usually faster and less costly, but the noise is never completely eliminated. (emphasis added)

1995 Figure 11 is a preferred embodiment of the combiner species.

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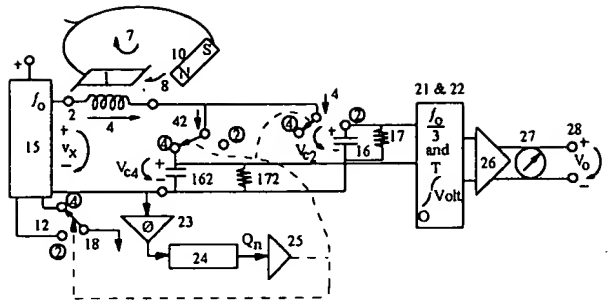


Fig. 11: A simpler implementation of the method defined in Eq. i).

The split core 1 of the sensor is placed around the conductor carrying the input current to be measured 7. The error due to unavoidable interfering noise in the form of a nearby magnet 10 is greatly reduced by the structure so that outputs 27 and 28 are a lot more accurate measure of input 7.

The cited references do not teach the elements of the present claim. Not singly, and not in combination. And the first four are not analogous or pertinent. The last does not have the teaching or the structure as required by MPEP 2131 and related reports.

TO ANTICIPATE A CLAIM, THE REFERENCE MUST TEACH EVERY ELEMENT OF THE CLAIM

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference."
Verdegaal Bros. v. Union Oil Co. of California, 2 USPQ2d

Cited References

Sweeny

Charles P. Sweeny teaches a motor speed control. And not one word is written about error correction or SNR. Instead he speaks of a Polyphase source of AC power, a variable voltage transformer, and controlling the speed of a motor.

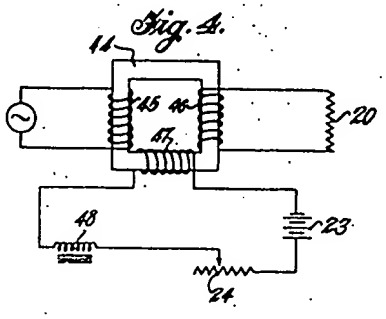
Jan. 7, 1941. C. P. SWEENY **2,227,468**

VARIABLE VOLTAGE TRANSFORMER

Filed Aug. 31, 1938

A still further modification of the variable voltage transformer is shown in Fig. 4. In this figure a conventional transformer 44 is shown upon which relatively widely spaced primary and secondary windings 45 and 46, respectively, are positioned. A single control winding 47 is shown for varying the saturation of the core 44. It will be noted that the alternating current flux in the core 44 will induce voltages in the control winding 47 such that the transformer of Fig. 4 is not suitable for use where alternating current voltages in the control circuit would be deleterious.

Fig. 4.



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In his 9-25-02 action - section 5 - the examiner proposes a magnet to cause noise.

> Looking at Figure 4 of Sweeny, as an example, winding 45 senses a current applied by the source connected to winding 45. Winding 46 responds to the flux in the core 44 and produces a voltage that is applied to resistance 20. If a magnet were placed adjacent the core 44 it would cause undesired interference or "noise".

Why look at Sweeny? He does not teach a "magnet", "undesired interference, or noise". These elements are from Swain's 1995 teaching.

MPEP 2143 says the teaching to make the combination must not be found in applicant's disclosure.

> **2143 Basic Requirements of a *Prima Facie* Case of Obviousness [R-1]**
>
> >To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.
>
> The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).<

Therefore the examiner's "magnet" and "noise" should not be used against Swain. Moreover, there is no reasonable expectation of success shown in Sweeny, or the rest of the cited art.

Next the examiner states that Sweeny's figure 4 provides a way to change the signal to noise ratio (SNR).

> In Figure 4 of Sweeny winding 47 applies a direct current bias to the core 44 which will change the signal-to-noise ratio. Moving the tap of variable resistor 24 in a first direction will increase the signal to noise ratio and moving the tap in the opposite direction will decrease the signal-to-noise ratio. Applicant has stated in his specification that changing the bias on a saturable core device will change the signal-to-noise ratio."

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Sweeny never mentioned SNR. The examiner's proposal has not been shown to work. I doubt that it will work. In addition, I did not say this. But even if it were so, the teaching came from me, not the references so it may not be used against me. MPEP 2143 says:

> **2143 Basic Requirements of a *Prima Facie* Case of Obviousness [R-1]**
>
> >To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.
>
> The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).<

None of the cited references infer or mention SNR. Swain 1995 is the source of "SNR" and misunderstood "saturatable core" teaching.

The examiner has apparently misunderstood Swain's 1995 teaching in connection with figure 12 and on a Hall device. Swain's variable reluctance structure and orthogonal field are very different from the examiners in line field due to a direct current in winding 47.

The changes proposed by the examiner would act to change Sweeny's operating principle or render Sweeny's structure inoperable, neither of which is permitted.

Sweeny is not analogous to or pertinent to an improved sensor having the Essential Characteristic and structure to substantially increase SNR in a machine. Sweeny does not have structure for an improved sensor having the Essential Characteristic or an operating parameter used to substantially increase SNR. Therefore Sweeny does not anticipate Swain.

Lee

Lee controls the AC power to a locomotive using direct current. There is no mention of SNR or error correction. The structure is vastly different from Swain.

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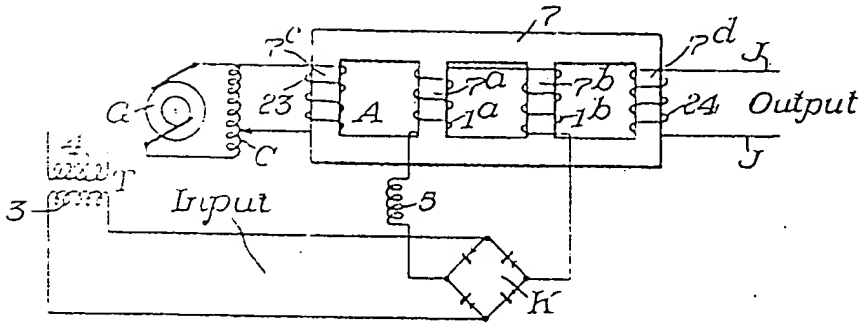
March 24, 1931. F. W. LEE 1,797,268

ELECTRICAL TRANSLATING APPARATUS

Original Filed Oct. 30, 1926



Referring to the drawing, the reference character A designates a reactor having a ladder shaped magnetizable core 7 provided with two outer cross bars 7° and 7°, and two inner cross bars 7° and 7°. The outer cross bar 7° is provided with a winding 23, and alternating current is supplied to this winding from a source which is here shown as an auto transformer C having its primary terminals connected with an alternator G.

Lee is not pertinent to or analogous to a sensor for more accurate measurement. Lee does not have structure for improving SNR in an implement for measurement.

Lee does not anticipate Swain.

Moser, et al

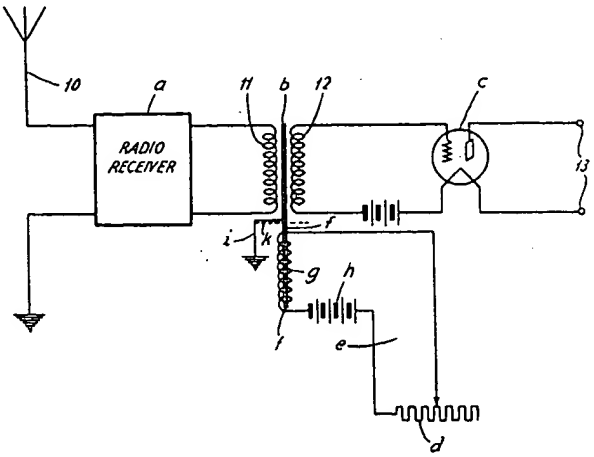
Moser controls the volume of a radio receiver from a remote point. There is no mention of error correction or SNR. The structure is vastly different from Swain.

June 29, 1937. W. MOSER ET AL 2,085,440

VOLUME CONTROL DEVICE

Filed Oct. 16, 1935

It is often desirable to control the output volume of a radio receiver from a point located at some distance from the receiver. This is especially true in using receivers in airplanes, automobiles and other situations where it is desirable that the receiver be located in an inaccessible place in order to conserve space. It is accordingly an object of our invention to provide such a volume control which is simple in construction and operation and inexpensive to install.



Moser is not pertinent to or analogous to a sensor for more accurate measurement. Moser does not have structure for improving SNR in an implement for measurement.

Moser, et al does not anticipate Swain.

Hubbard

Hubbard switches telephone circuits using a magnetic device instead of electrical contacts. There is no mention of error correction or SNR. The structure is vastly different from Swain.

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Oct. 22, 1940. F. A. HUBBARD 2,218,711

ELECTRICAL SWITCHING DEVICE

Filed Dec. 30, 1938

FIG. 1

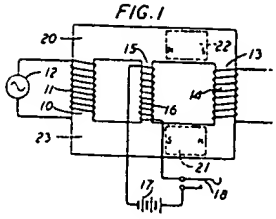


FIG. 2

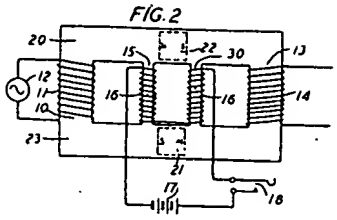


FIG. 3

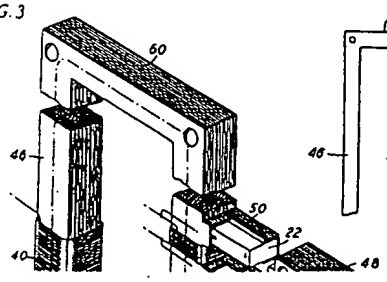
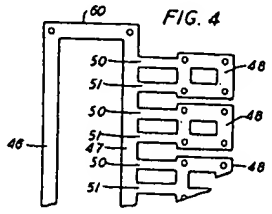


FIG. 4



This invention relates to electrical switching and particularly to alternating-current circuit controlling devices whose switching functions are performed inductively, thus obviating the need for circuit controlling contacts.

It is the object of this invention to provide an improved circuit controller of the type which functions to effectively control circuits without the use of circuit controlling contacts.

This object is attained in accordance with a feature of the invention by utilizing, in a circuit controller, a magnetic core structure of permalloy or similar alloy, which can be readily saturated by a steady field and which, when so saturated, becomes virtually non-magnetic to an alternating magnetomotive force of moderate intensity.

Another feature of the invention resides in the use of small permanent magnets embedded in the magnetic core which serve to normally saturate the core structure at particular points in the magnetic circuit, thereby effectively magnetically isolating those portions of the core which are separated from each other by the permanent magnets. By this arrangement a normal condition of substantial electrical uncoupling is maintained between input and output coils carried on separate legs of the magnetic core, which condition may be altered to effectively couple the input and output coils by passing direct current through a control winding carried by an intermediate leg of the core structure in such an amount as to saturate it and in the proper direction to oppose the saturating flux generated by the permanent magnets.

Hubbard is not pertinent to or analogous to a sensor for more accurate measurement.

Hubbard does not have structure for improving SNR in an implement for measurement.

Hubbard does not anticipate Swain.

Swain

In 1970 Swain taught a clamp-on direct current ammeter. There is no mention or inference of SNR or error correction. This was improved upon by Swain's teaching in 1995.

[54] MEANS FOR MEASURING MAGNITUDE AND DIRECTION OF A DIRECT CURRENT OR PERMANENT MAGNET, INCLUDING CLIP-ON DIRECT CURRENT SENSING INDUCTOR

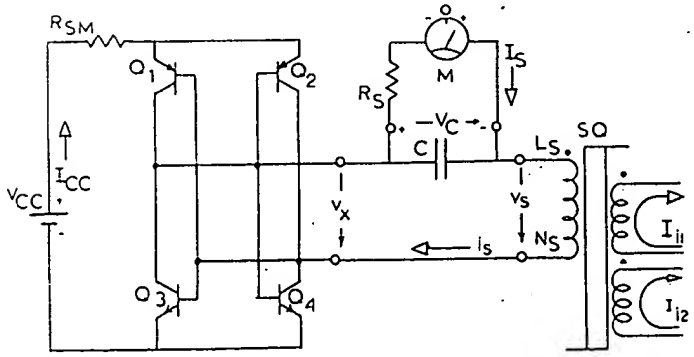
[76] Inventor: William H. Swain, 4662 Gleason Ave., Sarasota County, Fla. 33581

[22] Filed: June 9, 1970

[21] Appl. No.: 44,761

[11] 3,768,011

[45] Oct. 23, 1973



[57] ABSTRACT

A direct current or magnetic intensity input produces an offset in the average magnetic intensity applied to a sense inductor core of non-linear magnetic material. No electrical connection is required, and the measured current need not be interrupted. The core is coupled to an oscillator constructed so that the duty factor modulation and direct current output are linear functions of the input and restore the average magnetic intensity.

Clip-on DC milliameter sense inductors which largely cancel magnetic noise are included with the description of embodiments of this invention. They are sensitive, small in size, inexpensive, and will outperform larger and more costly devices. Power consumption is greatly reduced because fewer components are used more effectively.

1970

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10-23-02

Swain 1995 provided substantial improvement together with new method and structure. The title page states:

> (a) Title: Error Correction by Selective Modulation
>
> (c) Reference: U.S. Pat 3,768,011 granted to William H. Swain
>
> (d) Summary
>
> This invention relates to sensors and/or implements for measurement or control.

Swain 1995 teaches:

"an improved sensor"
"constructed to have the Essential Characteristic"
"to substantially increase said SNR", using
"selective modulation of operating parameter Q"

These are not stated or inferred in Swain 1970. Therefore Swain 1970 does not anticipate Swain 1995.

Further on, the examiner asserts:

> "Swain uses the same kind of core material as used in the present application and will thus inherently have the "essential characteristic"."

I regard this as speculation. The core materials were of different alloy, thickness, and handling; factors which make a great difference in how core material behaves. To get a sensor with the "Essential Characteristic" strong enough to be useful in a practical device requires optimization.

Optimization involves core form, type of steel, structure of lips, etc. Then the ampere-turns of the winding and its resistance, plus inverter voltage and the magnitude of I_{sm} need to be proper. Details are given in Swain 1995, especially figures 4 and 5, plus pages 34-37.

A good essential characteristic is not an inherent property. Proper design and construction are required. Swain's 1970 work was not as skilled as in 1995. MPEP 2112 says:

EXAMINER MUST PROVIDE RATIONALE OR EVIDENCE TENDING TO SHOW INHERENCY

>The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. *In re Rijckaert*, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993)(reversed rejection because inherency was based on what would result due to optimization of conditions, not what was necessarily present in the prior art); *In re Oelrich*, 666 F.2d 578, 581-82, 212 USPQ 323, 326 (CCPA 1981).<

In my 1970 work I did not have the Essential Characteristic. And if I had, I had no use for it. I had not found the problem of non-linear fields H_n from nearby magnets. And I had not learned how to operate the sensor to make use of the Essential Characteristic. Swain 1970 does not anticipate Swain 1995.

11-1-02

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Traverse of the Examiner's Section 5

I hold that the examiner errs in his section 5, which begins:

> 5. Claims 32-66 are rejected under 35 U.S.C. 102(b) as being fully anticipated by any one or Lee, Moser et al, Hubbard, Sweeny or Swain.

Lee, Moser, Hubbard, Sweeny or Swain 1970 did not patent or describe..., per 35 U.S.C. 102(b).

> **35 U.S.C. 102 Conditions for patentability; novelty and loss of right to patent.**
>
> A person shall be entitled to a patent unless —
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States, or

Lee, Moser, Hubbard and Sweeny are not analogous, and also not pertinent to the present invention, Swain 1995. They do not describe it, or even infer it. In addition, there is no motivation to combine with Swain 1970.

> **2141.01(a) Analogous and Nonanalogous Art [R-1]**
>
> >TO RELY ON A REFERENCE UNDER 35 U.S.C. 103, IT MUST BE ANALOGOUS PRIOR ART
>
> The examiner must determine what is "analogous prior art" for the purpose of analyzing the obviousness of the subject matter at issue. "In order to rely on a reference as a basis for rejection of an applicant's invention, the reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned." *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443, 1445 (Fed. Cir. 1992)

Sweeny

The following is a traverse of the examiner's section 5, especially with regard to Sweeny.

10-28-02

Jan. 7, 1941. C. P. SWEENY 2,227,468

VARIABLE VOLTAGE TRANSFORMER

Filed Aug. 31, 1938

Fig. 1.

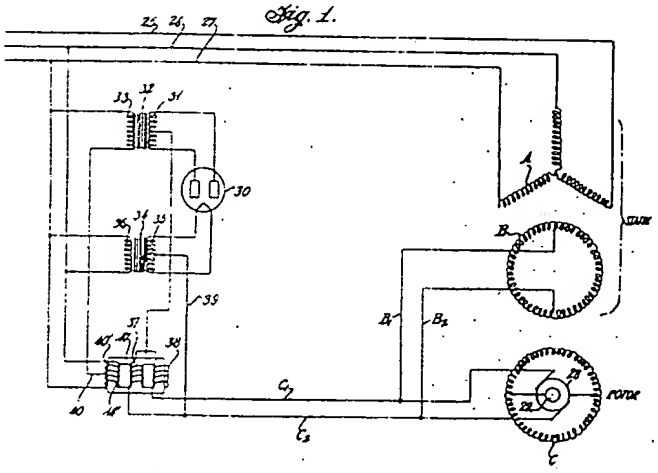


Fig. 2.

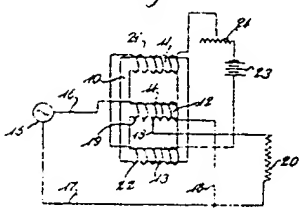


Fig. 4.

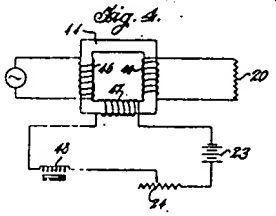
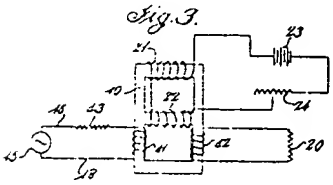


Fig. 3.



Inventor
Charles P. Sweeny
By Bacon & Thomas
Attorneys

VARIABLE VOLTAGE TRANSFORMER

Charles P. Sweeny, Detroit, Mich., assignor to Vickers Incorporated, Detroit, Mich., a corporation of Michigan

Application August 31, 1938, Serial No. 227,827

4 Claims. (Cl. 172—274)

This invention relates to variable voltage transformers, and more particularly to transformers in which the output voltage can be varied by varying the saturation of the core thereof.

An object of the present invention is to provide a transformer having means for varying the saturation of the core of the transformer in order to vary the output voltage.

Another object of the invention is to provide a transformer having supplemental windings upon the core thereof, which windings can be energized to vary the saturation of the core of the transformer and thereby vary the output voltage.

A further object of the invention is to provide a variable voltage transformer responsive to changes in frequency or amount of current flowing in a control winding upon the core of the transformer.

A still further object of the invention is to provide a system in which a transformer in which the output voltage depends upon the frequency of current flowing in a control winding upon the core of the transformer is employed to stabilize the speed of a variable speed electric motor.

Other objects and advantages of the invention will appear in the following description of preferred embodiments of the invention shown in the attached drawing, in which:

Figure 1 is a diagrammatic view of a system employing a transformer of the present invention;

Fig. 2 is a diagrammatic view of a modified transformer of the present invention;

Fig. 3 is a view similar to Fig. 2 of a further modified transformer; and

Fig. 4 is a view similar to Fig. 2 showing a still further modified form of transformer.

Referring to Fig. 2, the transformer of the present invention may comprise a core 10 having a plurality of legs 11, 12 and 13. In the modification shown, a tapped auto-transformer winding 14 may be positioned upon one of the legs, for example leg 12 of the core 10, and have the primary portions thereof supplied from any suitable source 15 of alternating current power through the conductors 16 and 17. A slider 18 is movable along the taps 19 of the winding 14 so as to provide for major variations in voltage across the load shown as a resistance 20 which is connected across the secondary portion of the auto-transformer winding, that is, between the slider 18 and the conductor 17. Control winding comprising coils 21 and 22 may be positioned upon the legs 11 and 13 of the transformer and be connected to a source of direct current, shown as a battery 23 through a variable resistor 24.

The transformer flux produced by the winding 14 threads the coils 21 and 22 to induce voltages therein. The coils 21 and 22 are preferably connected so that the voltages induced by this flux oppose each other so as to prevent any substantial alternating current voltages appearing in the control circuit, including battery 23 and resistor 24. When the coils 21 and 22 are thus connected and are energized from the source of direct current 23, a direct current flux is set up in the core 10 which increases the saturation thereof. If the winding 14 has a relatively few number of turns such that the core 10 is normally operated at relatively high saturation, any increase in saturation of the core due to the direct current energization will increase the reluctance to the alternating current flux and cause increased amounts of leakage flux. This leakage flux will not cut all of the turns of the winding 14 so that the effective voltage, that is to say, the root mean square value of the voltage across the load 20 decreases as direct current energization is increased even though the voltage across the source of alternating current power 15 remains constant. By varying the resistance of the variable resistor 24 in series with the control circuit, the effective voltage across the load 20 can be varied through quite wide limits without changing the position of the slider 18.

It is, of course, understood that any other suitable source of variable voltage direct current can be employed instead of the battery 23 and resistor 24. In fact, a variable voltage alternating current can be employed in the control circuit including the coils 21 and 22 to produce substantially the same result and such current may be of the same or different frequency from that of the source 15. The transformer can also be employed to vary the effective voltage across the load 20 in response to varying frequency of current in the control circuit. As the coils 21 and 22 have inductive reactance, the amount of current flowing through the coils 21 and 22 will decrease with increase of frequency of the control voltage even if the control voltage remains constant.

Advantage is taken of this characteristic of the transformer in the system shown in Figure 1. In this system, A is intended to represent a polyphase multipolar distributed winding of a variable speed electric motor also provided with a multipolar direct current winding B upon the

A still further modification of the variable voltage transformer is shown in Fig. 4. In this figure a conventional transformer 44 is shown upon which relatively widely spaced primary and secondary windings 45 and 46, respectively, are positioned. A single control winding 47 is shown for varying the saturation of the core 44. It will be noted that the alternating current flux in the core 44 will induce voltages in the control winding 47 such that the transformer of Fig. 4 is not suitable for use where alternating current voltages in the control circuit would be deleterious. Alternating currents in the control circuit can, however, be largely eliminated by employing a large inductance 48 in the control circuit.

Variable voltage transformers and systems herein described are capable of general application and may be employed wherever it is desired to vary an alternating current effective voltage in response to amount of current or frequency of current flowing within the control circuit. It will be appreciated that the present systems may be applied to polyphase circuits as well as single phase circuits. The systems herein disclosed are distinguished from conventional reactor circuits particularly in the fact that the effective voltage across the load is decreased with increase of control current, whereas in reactor circuits the effective voltage across the load is increased with in-

P. 2

P. 3

The sampling above shows that Sweeny teaches a variable voltage transformer for control of an AC motor.

This is a very different field of endeavor from the sensor and implement Swain used in 1995 to measure direct current with greatly improved SNR and error correction. A sampling is shown below.

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PATENT APPLICATION

(a) Title: Error Correction by Selective Modulation

(c) Reference: U.S. Pat 3,768,011 granted to William H. Swain

(d) Summary

This invention relates to sensors and/or implements for measurement or control.

The object of the invention is to improve accuracy by reducing error in the sensors output when in the presence of an interfering noise source.

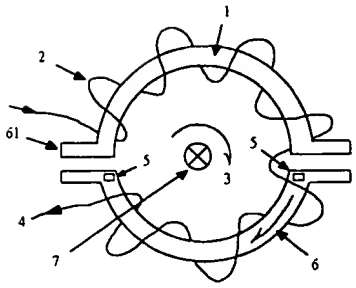


Fig. 1: A clamp-on sensor

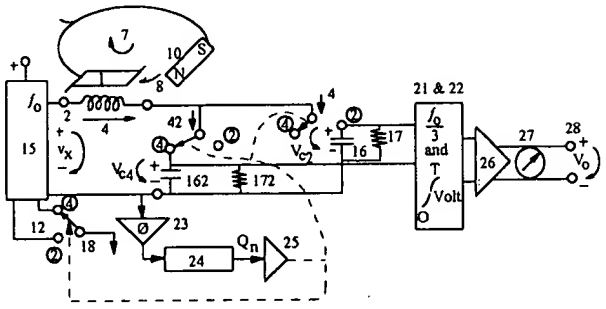


Fig. 11: A simpler implementation of the method defined in Eq. i).

(h) Abstract of the Disclosure.

The accuracy of certain sensors is greatly improved by improving their signal to noise ratio (SNR) in the presence of an interfering noise. Sensors were discovered which have a SNR which substantially changes when an operating parameter is selectively modulated to different magnitudes. Some noise can be practically eliminated. In the simplest form, the sensor is operated where it is both stable and close to its best SNR. This is usually faster and less costly, but the noise is never completely eliminated.

Swain 1995 teaches an improved sensor for a clamp-on DC ammeter; together with apparatus to make use of the sensor's "Essential Characteristic" to correct error and improve signal to noise ratio (SNR).

Sweeny, Swain 1970, and the others have not the teaching of the basic concept - Discovery, etc., of Swain 1995. And they have not the structure, sensor with greatly improved SNR, operating parameter, combiner, etc. These and others are in the generic claims 45, 63, 64, and 66.

10-28-02 C

That the cited references do not anticipate Swain 1995 will be shown in more detail in what follows.

Magnets

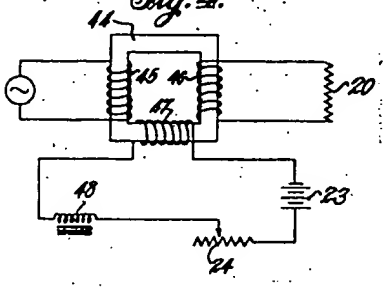
Figure 4 of Sweeny's variable voltage transformer is shown below. Power input is to winding 45. Power output is to load 20, spoken of as a motor.

Jan. 7, 1941. C. P. SWEENY 2,227,468

VARIABLE VOLTAGE TRANSFORMER

Filed Aug. 31, 1938

Fig. 4.



A still further modification of the variable voltage transformer is shown in Fig. 4. In this figure a conventional transformer 44 is shown upon which relatively widely spaced primary and secondary windings 45 and 46, respectively, are positioned. A single control winding 47 is shown for varying the saturation of the core 44. It will be noted that the alternating current flux in the core 44 will induce voltages in the control winding 47 such that the transformer of Fig. 4 is not suitable for use where alternating current voltages in the control circuit would be deleterious.

Page 2

The examiner proposes a magnet next to the core in his paragraph 5, line 6.

"If a magnet were placed adjacent the core 44 it would cause undesired interference or "noise"."

This change is likely to harm the transformer as designed by Sweeny. Sweeny does not specify a magnet or refer to magnetic interference.

MPEP 2143.01 states:

THE PROPOSED MODIFICATION CANNOT RENDER THE PRIOR ART UNSATISFACTORY FOR ITS INTENDED PURPOSE

If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984) (Claimed device was a blood filter assembly for use during medical procedures wherein both the inlet and outlet for the blood were located at the bottom end of the filter assembly, and wherein a gas vent was present at the top of the filter assembly. The prior art reference taught a liquid strainer for removing dirt and water from gasoline and other light oils wherein the inlet and outlet were at the top of the device, and wherein a pet-cock (stopcock) was located at the bottom of the device for periodically removing the collected dirt and water. The reference further taught that the separation is assisted by gravity. The Board concluded the claims were *prima facie* obvious, reasoning that it would have been obvious to turn the reference device upside down. The court reversed, finding that if the prior art device was turned upside down it would be inoperable for its intended purpose because the gasoline to be filtered would be trapped at the top, the water and heavier oils sought to be separated would flow out of the outlet instead of the purified gasoline, and the screen would become clogged.).

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The magnet in Sweeny will likely make Sweeny's device unsatisfactory. Therefore the magnet in Sweeny is not a proper argument against Swain.

The zero offset error due to unavoidable magnets near the sensor was the 1995 problem Swain set out to solve.

A magnet 10 near the sensor core 1 is shown in 1995 figure 3. The interference or noise (zero offset error) is discussed in Swain 1995 pages 10 and 11.

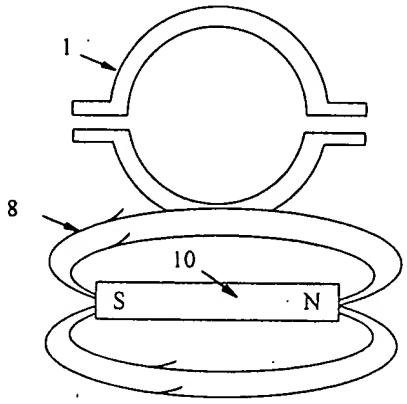

Fig. 3: A non-uniform magnetic field (H_n) 8 from a magnet acting on the core.

Sweeny never mentions "magnet". The examiner's "magnet" does not come from the Sweeny prior art, so it is not allowed by MPEP 2143, which states:

> **2143 Basic Requirements of a *Prima Facie* Case of Obviousness [R-1]**
>
> >To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.
>
> The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).<

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The teaching to use a magnet was not found in the prior art of Sweeny. It was found in Swain 1995.

Therefore Sweeny does not anticipate Swain.

A magnet is also shown in my 1995 figure 11, which is a preferred embodiment of the combiner species in generic claims 45, 63, 64, 65, and 66. The magnet is item 10. It is located near the direct current to be measured 7 and the core of the sensor 1.

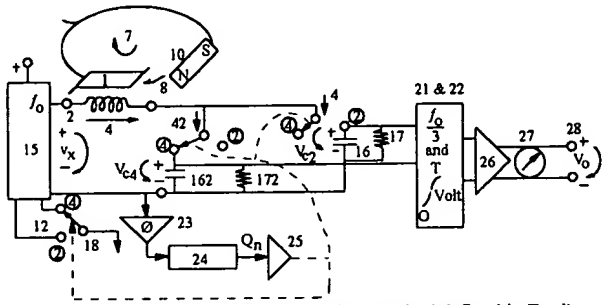


Fig. 11: A simpler implementation of the method defined in Eq. i).

The "magnet" is taught by Swain - not Sweeny. It may not be used against Swain.

Claim 45

The examiner states on line 7:

> Lines 4-13 of claim 45 deal with definition of signal-to-noise ratio and are not considered to add substance to claim 45.

But MPEP 2106 on page 2100-8 states:

> Finally, when evaluating the scope of a claim, every limitation in the claim must be considered. Office personnel may not dissect a claimed invention into discrete elements and then evaluate the elements in isolation. Instead, the claim as a whole must be considered. See, e.g., *Diamond* v. *Diehr*, 450 U.S. at 188–89, 209 USPQ at 9 ("In determining the eligibility of respondents' claimed process for patent protection under 101, their claims must be considered as a whole. It is inappropriate to dissect the claims into old and new elements and then to ignore the presence of the old elements in the analysis.

A primary object of the Swain 1995 work was to improve signal-to-noise ratio (SNR). Lines 4 to 13 in claim 45 are needed to "breathe life and meaning" into the rest of the claim.

> Claim 45 (amended) (Partial)
>
> An improved Sensor [for at least one of measuring or controlling,]
>
> having an output V responsive to a physical quantity I, and also
>
> responsive to an undesired interference N,
>
> 4. the ratio of

10-28-02

the said responsiveness of the said output V to said physical quantity I

in relation to

the said responsiveness of said output V to said interference N

being defined as the Sensor's signal to noise ratio SNR,

which can be stated in symbolic form:

$$SNR \equiv \frac{\delta V / \delta I}{\delta V / \delta N}, \text{ where}$$

10.

δV is a change in said output V,

δI is a change in said physical quantity I, and

13. δN is a change in said interference N; and also

MPEP 2111.02 supports lines 4 to 13.

2111.02 Weight of Preamble [R-1]

>PREAMBLE IS NONLIMITING UNLESS IT BREATHES LIFE AND MEANING INTO THE CLAIM

The preamble is not given the effect of a limitation unless it breathes life and meaning into the claim. In order to limit the claim, the preamble must be "essential to point out the invention defined by the claim." *Kropa* v.

Bias and SNR

The examiner, in line 11, states:

In Figure 4 of Sweeny winding 47 applies a direct current bias to the core 44 which will change the signal-to-noise ratio.

But Sweeny does not. On page 2, line 69, Sweeny calls winding 47 "a single control winding."

The examiner has changed the principal of operation of Sweeny. He has also removed his only control winding. Figure 4 will not work as Sweeny intended because there is no control winding when the examiner uses winding 47 for DC bias. Bias is understood to be constant - not a control input.

10/25/02

MPEP 2143.01 says:

THE PROPOSED MODIFICATION CANNOT RENDER THE PRIOR ART UNSATISFACTORY FOR ITS INTENDED PURPOSE

If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984) (Claimed device was a blood filter assembly for use during medical procedures wherein both the inlet and outlet for the blood were located at the bottom end of the filter assembly, and wherein a gas vent was present at the top of the filter assembly. The prior art reference taught a liquid strainer for removing dirt and water from gasoline and other light oils wherein the inlet and outlet were at the top of the device, and wherein a pet-cock (stopcock) was located at the bottom of the device for periodically removing the collected dirt and water. The reference further taught that the separation is assisted by gravity. The Board concluded the claims were *prima facie* obvious, reasoning that it would have been obvious to turn the reference device upside down. The court reversed, finding that if the prior art device was turned upside down it would be inoperable for its intended purpose because the gasoline to be filtered would be trapped at the top, the water and heavier oils sought to be separated would flow out of the outlet instead of the purified gasoline, and the screen would become clogged.).

THE PROPOSED MODIFICATION CANNOT CHANGE THE PRINCIPLE OF OPERATION OF A REFERENCE

If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959) (Claims were directed to an oil seal comprising a bore engaging portion with outwardly biased resilient spring fingers inserted in a resilient sealing member. The primary reference relied upon in a rejection based on a combination of references disclosed an oil seal wherein the bore engaging portion was reinforced by a cylindrical sheet metal casing. Patentee taught the device required rigidity for operation, whereas the claimed invention required resiliency. The court reversed the rejection holding the "suggested combination of references would require a substantial reconstruction and redesign of the elements shown in [the primary reference] as well as a change in the basic principle under which the [primary reference] construction was designed to operate." 123 USPQ at 352.).<

The examiner's proposed "bias" (line 11) makes the reference both:
unsatisfactory for its intended use, and also
changes the principal of operation.

Therefore Sweeny does not anticipate Swain.

On his line 12 the examiner proposes adjusting the proposed bias to change the SNR, by writing:

> Moving the tap of variable resistor 24 in a first direction will increase the signal to noise ratio and moving the tap in the opposite direction will decrease the signal-to-noise ratio.

This is an extension of Sweeny's work not supported by a reference or by experimental data. I do not think it will work as the examiner states because the gain from input winding 45 to load 20 will also change. SNR will likely change little. It changes the "principle of operation" of Sweeny. He never mentions SNR.

With Sweeny the input and output are AC, but with Swain the embodiments shown have DC input and output. The 1973 Swain reference is entirely DC input and DC output. But the examiner appears to propose an AC input to winding 45 and an AC output to load 20 to make use of the supposed increase and decrease in SNR. This is a change in the principle of operation of Sweeny. It is not suggested by Sweeny. This is not permitted by MPEP 2143.01, which states:

10-28-02

THE PROPOSED MODIFICATION CANNOT CHANGE THE PRINCIPLE OF OPERATION OF A REFERENCE

If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959) (Claims were directed to an oil seal comprising a bore engaging portion with outwardly biased resilient spring fingers inserted in a resilient sealing member. The primary reference relied upon in a rejection based on a combination of references disclosed an oil seal wherein the bore engaging portion was reinforced by a cylindrical sheet metal casing. Patentee taught the device required rigidity for operation, whereas the claimed invention required resiliency. The court reversed the rejection holding the "suggested combination of references would require a substantial reconstruction and redesign of the elements shown in [the primary reference] as well as a change in the basic principle under which the [primary reference] construction was designed to operate." 123 USPQ at 352.).<

Therefore Sweeny does not anticipate Swain 1995.

Furthermore the prior art does not suggest the desirability of moving the tap to change the SNR. MPEP 2143.01 states:

2143.01 **Suggestion or Motivation to Modify the References [R-1]**

>THE PRIOR ART MUST SUGGEST THE DESIRABILITY OF THE CLAIMED INVENTION

"In determining the propriety of the Patent Office case for obviousness in the first instance, it is necessary to ascertain whether or not the reference teachings would appear to be sufficient for one of ordinary skill in the relevant art having the reference before him to make the proposed substitution, combination, or other modification." *In re Linter*, 458 F.2d 1013, 173 USPQ 560, 562 (CCPA 1972).

In *In re Fine*, the claims were directed to a system for detecting and measuring minute quantities on nitrogen compounds comprising a gas chromatograph, a converter which converts nitrogen compounds into nitric oxide by combustion, and a nitric oxide detector. The primary reference disclosed a system for monitoring sulfur compounds comprising a chromatograph, combustion means, and a detector, and the secondary reference taught nitric oxide detectors. The examiner and Board asserted that it would have been within the skill of the art to substitute one type of detector for another in the system of the primary reference, however the court found there was no support or explanation of this conclusion and reversed.

Therefore Sweeny does not anticipate Swain, singly, or with Swain 1970.

10-31-02

Saturable Core and SNR

In his line 14 the examiner writes:

> Applicant has stated in his specification that changing the bias on a saturable core device will change the signal-to-noise ratio.

This is not really true. The examiner may have misinterpreted what I did write in my 1995 disclosure and also what I wrote about using the present invention to improve a Hall device based clamp-on DC ammeter. This involved changing core reluctance by use of an orthogonal magnetic field - not in line as proposed by the examiner on his line 11. An in line field is not practical. The preferred method shown in 1995 figure 12 uses reluctance modulation. This is shown below.

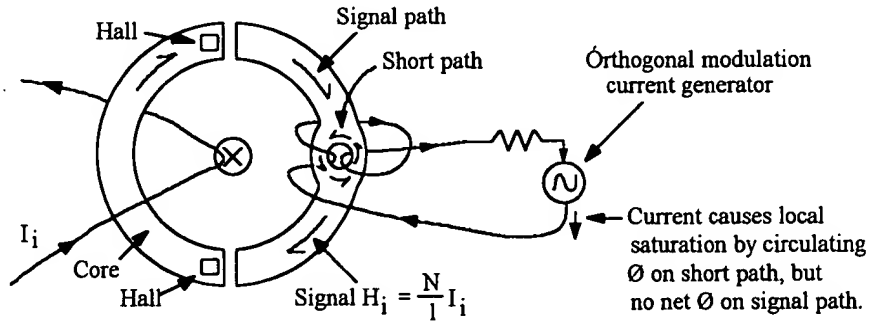


Fig. 12: Proposed core structure and magnetic reluctance selective modulation means for a Hall type clamp-on DC ammeter.

Reluctance and orthogonal modulation are very different from the examiner's line 11 proposal for a "DC bias" in core 44. This would create a field in line with - not perpendicular to the main core. It would look like a large input signal, and thus be impractical. This is another example of a change in operating principle, and thus not permitted by MPEP 2143.01.

At the end of his section 5, the examiner writes:

> Swain uses the same kind of core materials as used in the present application and will thus inherently have the "essential characteristic".

This is likely not true in the sense of the present invention Swain 1995. We find major variations in core material bought from the same supplier by the same part number and used in the same way. Steel good enough to use in making our fine clamp-on DC ammeters is not inherently available. Care and testing are needed. This is why generic claim 64 includes the word "show":

11-1-02

Part of Claim 64 show that said Essential Characteristic type sensor has a useful said Essential Characteristic
evidenced by
a signal to noise ratio SNR of said sensor observed to change a lot when the said magnitude Q of said operating parameter is modulated over a practical range;

Tests are needed to demonstrate that a "strong" or "good" Essential Characteristic is available. My 1995 application provided for this, starting on page 19. I conclude on page 20 that when g_A about equals g_B, and ß is about ½ that the sensor characteristics are good.

And the Swain 1973 core material is not really the same kind as the Swain 1995. This is because type and handling make a big difference. Swain 1973 used Magnetics ½ mil Supermalloy for ¼" cores, and type 4A for ¾" cores. Swain 1995 used Magnetics 4D for 5" cores.

It is not at all sure that the 1973 sensors had a "good" Essential Characteristic. In any event - no one checked, or even understood enough to ask.

Even if the Essential Characteristic had been present in my 1970 cores, there was provided no structure to use it for improved SNR. That was because I had not even looked for the "Discovery" or Essential Characteristic. So I never provided structure to use it. My 1973 disclosure did not anticipate the Essential Characteristic in my 1995 application.

Conclusion

The cited references do not anticipate Swain 1995. No one reference anticipates all structural elements in generic claims 45, 63, 64, and 66. And no permitted combination anticipates all elements and structure as required by MPEP 706.02(a), not in any claim 32-66.

DISTINCTION BETWEEN 35 U.S.C. 102 AND 103

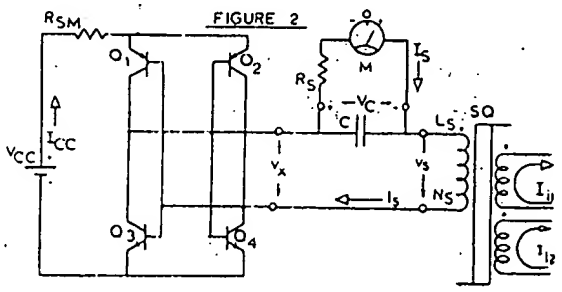
> The distinction between rejections based on 35 U.S.C. 102 and those based on 35 U.S.C. 103 should be kept in mind. Under the former, the claim is anticipated by the reference. No question of obviousness is present. In other words, for anticipation under 35 U.S.C. 102, the reference must teach every aspect of the claimed invention either explicitly or impliedly. Any feature not directly taught must be inherently present. Whereas, in a rejection based on 35 U.S.C. 103, the reference teachings must somehow be modified in order to meet the claims. The modification must be one which would have been obvious to one of ordinary skill in the art at the time the invention was made. See MPEP

5-29-02

Swain 1995 is not anticipated by Swain 1970, even when combined with Sweeny.

Swain 1970 and Swain 1995.

William H. Swain taught, in his 1970 application, how to make a clamp-on direct current ammeter.



Swain 1970 gives no teaching nor suggestion of how to "substantially increase SNR" using the "Essential Characteristic" of the sensor together with the "Operating Parameter Q" of claims 45, 63, 64, 66. This is provided in Swain 1995. Figure 11 is one embodiment.

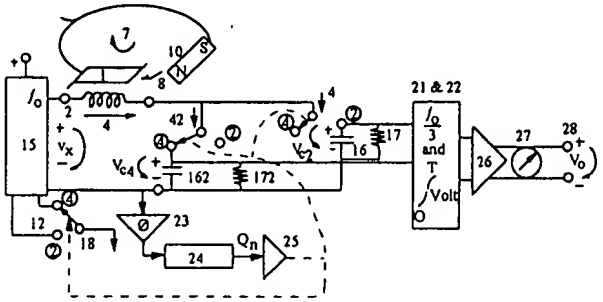


Fig. 11: A simpler implementation of the method defined in Eq. i).

MPEP 2143.03 states:

> **2143.03 All Claim Limitations Must Be Taught or Suggested [R-1]**
>
> >To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

10-23-02

The present invention uses:

"an improved sensor"

"constructed to have the Essential Characteristic"

"selective modulation of operating parameter Q"

"means enabling said sensor to substantially increase said SNR", using

These limitations (elements) of claim 45 are made more specific and elaborated upon in other generic claims 63, 64, , and 66.

Swain did not in any place teach or imply these in his 1970 application. I know. I wrote it, and have read it carefully since then. And I had to work long and hard in 1995 before I was, by the grace of God, able to make the present invention.

10-25-02

SNR in Claim 45

In his section 5, the examiner writes:

> "Lines 4-13 of claim 45 deal with definition of signal-to-noise ratio and are not considered to add substance to claim 45."

35 U.S.C. 112 says:

> An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.
>
> (Amended July 24, 1965, Public Law 89-83, sec. 9, 79 Stat. 261; Nov. 14, 1975, Public Law 94-131, sec. 7, 89 Stat. 691.)

Lines 4-13 add substance to claim 45 because they are construed to cover the teaching in the specification concerning the basic concept and its use. For example:

The definitions of V, I, and N on lines 11-13 are found to correspond to the teaching about sensors and their properties in:

Figures 4 and 5,
The "Discovery" on page 11, and
The "Essential Characteristic" on page 11.

The statements involving ratio, responsiveness and SNR in lines 4 to 10 are found to correspond to:

The definition of a good Essential Characteristic on pages 19 and 20.
The operation of the sensor in species "Better SNR" or "Combiner", and
The means for achieving error correction by selective modulation in figures 9 and 11.

These lines 4-13 define key terms in the claim, SNR for example. They also "breathe life and meaning" into the claims.

Claim 45 is distinctly different from Sweeny and Swain 1970, for example. They never mention or imply terms analogous to:

ratio, responsiveness, and in relation to, as in the "Discovery", page 11;
Interference N, SNR, as in non-linear field H_n of figure 3.

10-25-02

Claim 45 (amended)

An improved Sensor [for at least one of measuring or controlling,]

having an output V responsive to a physical quantity I, and also

responsive to an undesired interference N,

4. the ratio of

the said responsiveness of the said output V to said physical quantity I

in relation to

the said responsiveness of said output V to said interference N

being defined as the Sensor's signal to noise ratio SNR,

which can be stated in symbolic form:

$$SNR \equiv \frac{\delta V / \delta I}{\delta V / \delta N}, \text{ where}$$

10.

δV is a change in said output V,

δI is a change in said physical quantity I, and

13. δN is a change in said interference N; and also

said Sensor is [at least one of found or] constructed to have the Essential Characteristic that the

said signal to noise ratio SNR is

substantially altered by Selective Modulation of an Operating Parameter Q, and

means enabling said Sensor to [function] substantially increase said SNR in at least one of:

[as] a [part of] Machine, or independently.

These lines 4 to 13 "breathe life and meaning into the claim. MPEP 2111.02 supports my inclusion of these lines.

2111.02 Weight of Preamble [R-1]

>PREAMBLE IS NONLIMITING UNLESS IT BREATHES LIFE AND MEANING INTO THE CLAIM

The preamble is not given the effect of a limitation unless it breathes life and meaning into the claim. In order to limit the claim, the preamble must be "essential to point out the invention defined by the claim." *Kropa* v. *Robie*, 88 USPQ 478, 481 (CCPA 1951) (discussed below). In claims directed to articles and apparatus, any phraseology in the preamble that limits the structure of that article or apparatus must be given weight. *In re Stencel*, 4 USPQ2d 1071 (Fed. Cir. 1987) (discussed below)

10-25-02

Moreover, MPEP 2106 on page 2100-8 states:

"...their claims must be considered as a whole". Lines 4-13 are part of claim 45.

Swain and Sweeny

In his section 5 the examiner further writes:

> "Lines 14 to 18 of claim 45 require that the signal-to-noise ratio of the sensor be substantially altered by changing an operating parameter and also require a means enabling the sensor to substantially increase its signal-to-noise ratio. In Figure 4 of Sweeny winding 47 applies a direct current bias to the core 44 which will change the signal-to-noise ratio. Moving the tap of variable resistor 24 in a first direction will increase the signal to noise ratio and moving the tap in the opposite direction will decrease the signal-to-noise ratio. Applicant has stated in his specification that changing the bias on a saturable core device will change the signal-to-noise ratio."

"Signal-to-noise ratio" is nowhere mentioned, or inferred in Sweeny. Winding 47 is not used to measure anything. Instead it is a "control winding" (line 69 of Sweeny).

If Sweeny figure 4 were made into a clamp-on direct current ammeter - or a DC ammeter of any kind, the "...winding 47 applies a direct current bias..." would become a signal. It would have to be very stable if treated as a bias. Not available for "modulation". Not a practical design to make a useful "Essential Characteristic".

In Sweeny, the examiners "...winding 47 applies direct current bias to core 44 which will change the signal to noise ratio..." will remove the "control" input (line 69) and make Sweeny inoperative. This is not permitted by MPEP 2143.01 which states:

10-25-02

> If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984) (Claimed device was a blood filter assembly for use during medical procedures wherein both the inlet and outlet for the blood were located at the bottom end of the filter assembly, and wherein a gas vent was present at the top of the filter assembly. The prior art reference taught a liquid strainer for removing dirt and water from gasoline and other light oils wherein the inlet and outlet were at the top of the device, and wherein a pet-cock (stopcock) was located at the bottom of the device for periodically removing the collected dirt and water. The reference further taught that the separation is assisted by gravity. The Board concluded the claims were *prima facie* obvious, reasoning that it would have been obvious to turn the reference device upside down. The court reversed, finding that if the prior art device was turned upside down it would be inoperable for its intended purpose because the gasoline to be filtered would be trapped at the top, the water and heavier oils sought to be separated would flow out of the outlet instead of the purified gasoline, and the screen would become clogged.).

Even if the examiner's "bias" to "winding 47" were somehow operable, it could not be used because Sweeny gives no objective reason to combine. MPEP 2143.01 states:

> FACT THAT THE CLAIMED INVENTION IS WITHIN THE CAPABILITIES OF ONE OF ORDINARY SKILL IN THE ART IS NOT SUFFICIENT BY ITSELF TO ESTABLISH *PRIMA FACIE* OBVIOUSNESS
>
> A statement that modifications of the prior art to meet the claimed invention would have been "'well within the ordinary skill of the art at the time the claimed invention was made'" because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references. *Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993).

10-23-02

The motive to so modify is not found in Sweeny. MPEP 2143.01 states:

2143.01 Suggestion or Motivation to Modify the References [R-1]

> THE PRIOR ART MUST SUGGEST THE DESIRABILITY OF THE CLAIMED INVENTION

"In determining the propriety of the Patent Office case for obviousness in the first instance, it is necessary to ascertain whether or not the reference teachings would appear to be sufficient for one of ordinary skill in the relevant art having the reference before him to make the proposed substitution, combination, or other modification." *In re Linter*, 458 F.2d 1013, 173 USPQ 560, 562 (CCPA 1972).

Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

In Swain, such a winding will do no good, and likely a lot of harm.

There is no incentive - no motive - to use the examiner's "...direct current bias to core 44..."

Therefore Sweeny, even in combination with Swain 1970, does not anticipate Swain 1995.

The examiner is mistaken in saying:

> "Applicant has stated in his specification that changing the bias of a saturable core device will change the signal-to-noise ratio."

This is not true.

However, the examiner may have misunderstood my use of an orthogonal field and reluctance modulation to change the signal-to-noise ratio (SNR) of a Hall device.

Orthogonal field is discussed in my 1995, pages 28 and 38. This is a magnetic field perpendicular to the plane of the core in the Hall device I modified. Thus it changes reluctance without injecting a field around the loop. If this were done it would act as an erroneous signal input, and make trouble.

A preferred variable reluctance method was given in my 1995 figure 12, shown below. Figure 12 is discussed on pages 39 and 40 of my 1995 teaching.

10-23-02

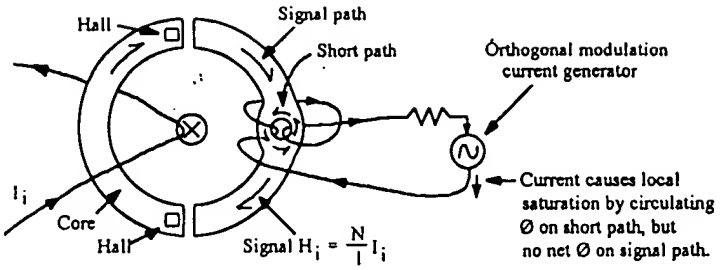


Fig. 12: Proposed core structure and magnetic reluctance selective modulation means for a Hall type clamp-on DC ammeter.

This is another form of orthogonal field which can sometimes - not always- be used to modify SNR. Both are entirely different from the examiner's proposal, and from Sweeny's patent.

Even if the combination of the examiner's proposal and Sweeny could be used in Swain 1970 and made to work, it could not be used against Swain 1995, because the examiner found the idea in Swain 1995, not Sweeny.

MPEP 2143 states:

> **2143 Basic Requirements of a *Prima Facie* Case of Obviousness [R-1]**
>
> >To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.
>
> The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).<

The "expectation of success" cannot be taken from "applicants disclosure".

The examiner writes:

> "Applicant has stated in his specification that changing the bias on a saturable core device will change the signal-to-noise ratio."

10-23-02

Then the examiner's suggestion that:

> "Moving the tap of variable resistor 24 in a first direction will increase the signal to noise ratio and moving the tap in the opposite direction will decrease the signal-to-noise ratio."

should not be used as basis for rejection of the present claims because it is not permitted by MPEP 2143 to use "applicant's disclosure" to provide the "expectation of success".

Given the problem of interference (noise), there is no motivation or expectation of success to go to Sweeny because he teaches "...control winding 47...", not measurement. Nor does he measure DC. He uses DC for control.

Claim limitations "sensor to substantially increase said SNR" using the "Essential Characteristic" in an "improved sensor" are not in the cited references - taken singly, or all at once.

Even if there were some form of Essential Characteristic in Sweeny as modified by the examiner, Sweeny does not teach or infer how to use it for "error correction by selective modulation to improve accuracy", as in page 1 of Swain 1995.

Conclusion

Considering the claims as a whole, neither Swain 1970 nor Sweeny anticipates Swain 1995. Nor do they do so in any permitted combination.

10-25-02

Method and Means Contrary to the Art.

The present invention teaches a basic concept, i.e., a method and means contrary to the understandings and expectations of the art. Swain 1970, column 17, teaches what was then the understanding of the art: Make the sensor itself as carefully as feasible so as to largely cancel magnetic noise. Then shield the sensor if this is feasible.

MPEP 2141.02 states:

> THE CLAIMED INVENTION AS A WHOLE MUST BE CONSIDERED
>
> In determining the differences between the prior art and the claims, the question under 35 U.S.C. 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. *Stratoflex, Inc.* v. *Aeroquip Corp.*, 713 F.2d 1530, 218 USPQ 871 (Fed. Cir. 1983); *Schenck* v. *Nortron Corp.*, 713 F.2d 782, 218 USPQ 698 (Fed. Cir. 1983) (Claims were directed to a vibratory testing machine (a hard-bearing wheel balancer) comprising a holding structure, a base structure, and a supporting means which form "a single integral and gaplessly continuous piece." *Nortron* argued the invention is just making integral what had been made in four bolted pieces, improperly limiting the focus to a structural difference from the prior art and failing to consider the invention as a whole. The prior art perceived a need for mechanisms to dampen resonance, whereas the inventor eliminated the need for dampening via the one-piece gapless support structure. "Because that insight was contrary to the understandings and expectations of the art, the structure effectuating it would not have been obvious to those skilled in the art." 218 USPQ at 700 (citations

Thus the 1995 basic concept would not have been obvious to those skilled in the art.

10-14-02

The 1970 art was shown by Swain in his 1970 application:

United States Patent [19]

Swain

[11] 3,768,011

[45] Oct. 23, 1973

[54] MEANS FOR MEASURING MAGNITUDE AND DIRECTION OF A DIRECT CURRENT OR PERMANENT MAGNET, INCLUDING CLIP-ON DIRECT CURRENT SENSING INDUCTOR

[76] Inventor: William H. Swain, 4662 Gleason Ave., Sarasota County, Fla. 33581

[22] Filed: June 9, 1970

[21] Appl. No.: 44,761

-17-

In order to conveniently measure a small direct current flowing in a small wire in a restricted space such as is found in a cable bundle leading to a printed circuit card connector in a computer, I have constructed two small clip-on sense inductors as shown in FIGS. 5 and 6. In these the suppression of undesired magnetic noise is obtained by using a combination of the following techniques:

1. The mean flux path length *l* is minimized by making the whole structure small;
2. The core permeability is maximized by core material selection;
3. The reluctance of the air gap is minimized
3. The reluctance of the air gap is minimized by using an overlapping fold technique similar to that used in sealing the lid on a tin can cylinder as in FIG. 5, or the cross-sectional area of the but joint is increased to give a large area joint as in FIG. 6;
4. The width of the core tape is reduced under the winding and increased near the air gap to reduce gap reluctance relative to coil cor sector reluctance, since the noise magnetic field effective in the core sector directly under the winding is the principal source of error. Noise fields near the air gap are a lesser problem if they do not cause a field to appear under the sense coil winding.
5. Each is small so that a modest sized high permeability soft iron magnetic shield cylinder can be pushed down over the lead wire pair to the clip and slightly past the end where the sense inductor is located, assuming that the wire to be measured is flexible and has a little slack. If not, a notch in the end of the shield will allow the shield to cover the

[57] ABSTRACT

A direct current or magnetic intensity input produces an offset in the average magnetic intensity applied to a sense inductor core of non-linear magnetic material. No electrical connection is required, and the measured current need not be interrupted. The core is coupled to an oscillator constructed so that the duty factor modulation and direct current output are linear functions of the input and restore the average magnetic intensity.

Clip-on DC milliameter sense inductors which largely cancel magnetic noise are included with the description of embodiments of this invention. They are sensitive, small in size, inexpensive, and will outperform larger and more costly devices. Power consumption is greatly reduced because fewer components are used more effectively.

Noise suppression was achieved by skilled construction of the sense inductor itself. The electronics were not mentioned.

10-14-02

Swain 1995 teaches a novel way for still better noise canceling properties: Make a good sensor as before, and then a second step: use the electronics - the Operating Parameter - to change the SNR. This works if the sensor has a good Essential Characteristic. I state it in my 1995 abstract:

> (h) Abstract of the Disclosure.
>
> The accuracy of certain sensors is greatly improved by improving their signal to noise ratio (SNR) in the presence of an interfering noise. Sensors were discovered which have a SNR which substantially changes when an operating parameter is selectively modulated to different magnitudes. Some noise can be practically eliminated. In the simplest form, the sensor is operated where it is both stable and close to its best SNR. This is usually faster and less costly, but the noise is never completely eliminated.

A good sensor's SNR behavior is graphed in figure 5. The operating parameter is I_{sm}, i.e., the drive.

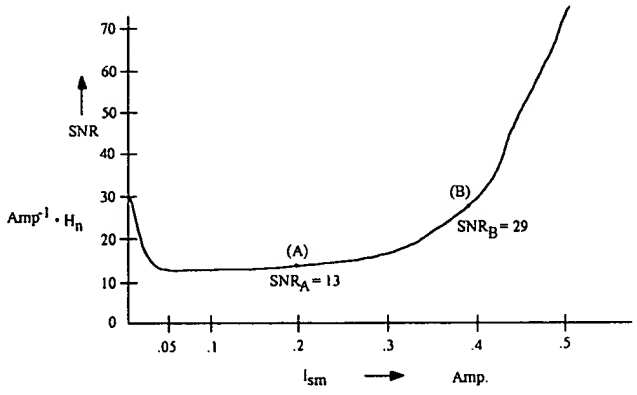


Figure 5
Signal to Noise Ratio (SNR) for Non-Uniform Field H_n
vs.
Operating Parameter I_{sm}
for
5" dia. aperture clip #88 in SN 2336

$$SNR = \frac{\delta V_{output}/\delta I_{input}}{\delta V_{output}/\delta N_{noise}}$$

Given a good sensor with a good Essential Characteristic, set the operating parameter Q (here I_{sm}) at an optimum practical point ((B) in figure 5), and operate there to get over double the SNR of the prior art. This is the better SNR species. In the years before 1995 Swain operated near point A. The 1995 "Discovery" was a real help.

For still better SNR use the method of the combiner species. This too is outlined in the 1995 abstract.

10-14-03

The abstract continues:

> Often, the method involves operating the sensor in first one state and then another wherein the operating parameter has conditions where the sensor is stable, reproducible, and reliable, and wherein the SNRs are substantially different. output of a state is combined with the output of another state in such a way that the noise cancels but a signal remains. Often the output in a state having greater noise is attenuated until it matches the noise content of another state having less noise. Then these outputs are subtracted. The difference is the more accurate error corrected output. In the ideal case, the difference has no noise output because the noise in the output from one state canceled the noise in the output of the other state.

The present invention improves the sensor in two steps:

Step 1 is its construction.

Step 2 is use the Operating Parameter - the drive - the electronics.

For maximum improvement the noise canceling combiner method can be used. This can be part of the second step; how the sensor is driven, i.e., selectively modulated.

This invention adds the second step to the method for getting better sensor SNR - use the electrical drive, i.e., selectively modulate the magnitude of operating parameter Q.

The I_{sm} drive is always symmetrical - many pulses per second, first in the positive sense, and then equally in the negative sense.

The examiner's proposed bias in only one direction will not work. It would act as a large input or error signal.

The cited references do not teach the benefit of Swain's 2 step method of 1995: Build a good sensor with the Essential Characteristic, and then drive it electrically so as to get a lot better SNR. Swain 1995 teaches contrary to the art. Therefore none of the five cited references anticipate Swain 1995.

10-16-02 //

I Discovered the Source of the Problem, so the Invention is Patentable.

It happened this way.

After I had received the patent on Swain 1970 I repeatedly observed zero offset error when the sensor was at a certain location on a pipe, but not at others. I eventually found that this was due to local magnetic "hot spots" in the pipe. Sometimes the sensor would inadvertently be placed near one of these hot spots.

This is shown in my 1995 figure 3. Figure 3 is discussed in 1995 pages 9, 10, and 11. The magnet represents a magnetic "hot spot" in the pipe.

I then experimented with various means to correct the problem and, by the grace of God, I eventually found the basic concept - "Discovery" and "Essential Characteristic" and means to implement it.

MPEP 2141.02 states:

DISCOVERING SOURCE/CAUSE OF A PROBLEM IS PART OF "AS A WHOLE" INQUIRY

"[A] patentable invention may lie in the discovery of the source of a problem even though the remedy may be obvious once the source of the problem is identified. This is part of the 'subject matter as a whole' which should always be considered in determining the obviousness of an invention under 35 U.S.C. § 103." *In re Sponnoble*, 405 F.2d 578, 585, 160 USPQ 237, 243 (CCPA 1969).

from prior art which contains the same solution for a similar problem." *In re Wiseman*, 596 F.2d 1019, 201 USPQ 658, 661 (CCPA 1979) (emphasis in original).

In *In re Sponnoble*, the claim was directed to a plural compartment mixing vial wherein a center seal plug was placed between two compartments for temporarily isolating a liquid–containing compartment from a solids–containing compartment. The claim differed from the prior art in the selection of butyl rubber with a silicone coating as the plug material instead of natural rubber. The prior art recognized that leakage from the liquid to the solids compartment was a problem, and considered the problem to be a result of moisture passing around the center plug because of microscopic fissures inherently present in molded or blown glass. The court found the inventor discovered the cause of moisture transmission was through the center plug, and there was no teaching in the prior art which would suggest the necessity of selecting applicant's plug material which was more impervious to liquids than the natural rubber plug of the prior art.

Swain 1995 discloses the source of the problem, so it is a patentable invention.

10-29-02

9

Swain 1995 includes teaching and structure not in Swain 1970, or in the other cited references.

Personal experience

I know from personal experience that Swain 1973 does not anticipate Swain 1995. I wrote the 1970 application and debated its merit with Mr. Ernest F. Karlsen, who as I remember it, assisted me in writing a better claim 1. Figure 2 below is the cover drawing.

United States Patent [19]

Swain

[11] 3,768,011

[45] Oct. 23, 1973

[54] MEANS FOR MEASURING MAGNITUDE AND DIRECTION OF A DIRECT CURRENT OR PERMANENT MAGNET, INCLUDING CLIP-ON DIRECT CURRENT SENSING INDUCTOR

[76] Inventor: William H. Swain, 4662 Gleason Ave., Sarasota County, Fla. 33581

[22] Filed: June 9, 1970

[21] Appl. No.: 44,761

[52] U.S. Cl. ..... 324/117 R, 324/43 R

[51] Int. Cl. G01r 33/00, G01r 33/02

[58] Field of Search ..... 324/117 R, 127, 43 R, 324/43 G; 323/48; 328/13, 150

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3,487,299	12/1969	Hart et al.	324/43

Primary Examiner—Rudolph V. Rolinec
Assistant Examiner—Ernest F. Karlsen

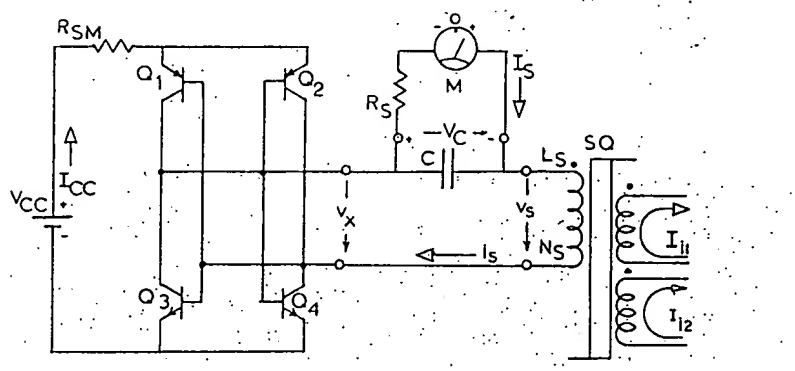
[57] ABSTRACT

A direct current or magnetic intensity input produces an offset in the average magnetic intensity applied to a sense inductor core of non-linear magnetic material. No electrical connection is required, and the measured current need not be interrupted. The core is coupled to an oscillator constructed so that the duty factor modulation and direct current output are linear functions of the input and restore the average magnetic intensity.

Clip-on DC milliameter sense inductors which largely cancel magnetic noise are included with the description of embodiments of this invention. They are sensitive, small in size, inexpensive, and will outperform larger and more costly devices. Power consumption is greatly reduced because fewer components are used more effectively.

16 Claims, 9 Drawing Figures

Figure 2



I had to work long and hard to overcome zero offset error due to nearby magnetic noise. By the grace of God I was able in 1995 to build and demonstrate successful operation of a noise canceling implementation of application 08-578,395. This included figure 11 which shows the primary interconnections and structure. Generic Claims 45, 63, 64, and 66 cover the art of figure 11.

10-28-02 4/
29

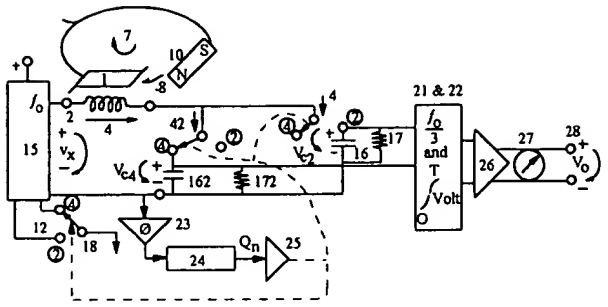


Fig. 11: A simpler implementation of the method defined in Eq. i).

I am at least as well qualified as the "person of ordinary skill in the art." I graduated from Cornell University with a BSEE, Columbia University with a MSEE, was granted 10 Patents, I am a licensed Professional Engineer in Florida, and I designed clamp-on DC Ammeters which are in use worldwide.

Yet I needed to work hard to invent method and means for considerably reducing or canceling error due to a non-uniform magnetic field near the sensor. If the solution had been in my 1973 patent I surely would have used it. The basic concept - "Discovery" and "Essential Characteristic" of Swain 1995 and how to use them are not in Swain 1973.

Swain
Essential Characteristic

I think the Examiner does not have basis to write his action, page 3:

> "Swain uses the same kind of core material as used in the present application and will thus inherently have the "essential characteristic"."

We have found that some core material can not be used at all, and had to be replaced, even though purchased with the same part number as previously successful material. In another case, we could not use one of our standard methods of refining a sensor for several months. A new lot of core material had to be purchased.

I do not believe the examiner can state any better than I the presence or absence of the "Essential Characteristic" in our 1970 sensors. I doubt it, but I am not sure. No one then knew to ask.

A strong and useful Essential Characteristic is required.

An example of a strong and useful Essential Characteristic is shown in figure 5 on page 2 of this response. The SNR at point (A) is only 13, but at point (B) it is 29. The ratio of A/B is .45.

The calculation and interpretation are shown in Swain 1995, especially pages 19 and 20. These state, in part:

10-29-02

ESSENTIAL CHARACTERISTIC

To determine whether or not a sensor has a strong essential characteristic, consider two extremes.

Use of the general equation i) augmented by Eq. j) will soon show which sensor characteristics are good and which may lead to complications. For now, I am most confident with gA close to gB, and ß close to one half. (Emphasis added).

This confirms that the 5" clip sensor of figure 5 should be useful when used to get error correction by selective modulation, and thereby greatly improved accuracy in the presence of a non-uniform magnetic field.

There may have been a week Essential Characteristic in the sensors of Swain 1970, but I am convinced it was not strong enough to be useful. And even if it was, there was in Swain 1970 no teaching or structure for its operation to improve SNR and accuracy. Therefore Swain 1970 does not anticipate Swain 1995.

The need to calculate g_A, g_B, and ß represents and independent limitation on the claims. MPEP 2106 on page 2100-18 states:

> (ii) **Necessary Antecedent Step to Performance of a Mathematical Operation or Independent Limitation on a Claimed Process**
>
> If a claim requires acts to be performed to create data that will then be used in a process representing a practical application of one or more mathematical operations, those acts must be treated as further limiting the claim beyond the mathematical operation(s) *per se*. Such acts are data gathering steps not dictated by the algorithm but by other limitations which require certain antecedent steps and as such constitute an independent limitation on the claim.

The present four generic claims each include phrases like - substantially altered, changes a lot, calibrated or constructed by a proven process to assure a strong essential characteristic - these too claim a practical device which works.

The 1970 application for Swain Patent 3,768,011 does not mention, nor even infer the "Essential Characteristic", much less the strength required. And it does not state or infer the Structure needed to make use of the "Essential Characteristic". Therefore it does not anticipate Swain 1995.

10-31-02

Swain
Structure

Even if a sensor has the Essential Characteristic it is of no use unless the structure needed to use it is provided.

Present Generic Claims 45, 63, 64, and 66, in fact, all the claims 32-66 recite structure not found in Swain 1970.

This structure is required to control SNR so as to achieve the noise reduction or noise cancellation of the present invention. The following excerpts from the generic claims are given as examples of structure provided. Some elements are underlined.

45.

said Sensor is [at least one of found or] constructed to have the Essential Characteristic that the said signal to noise ratio SNR is

substantially altered by Selective Modulation of an Operating Parameter Q, and

means enabling said Sensor to [function] substantially increase said SNR in at least one of:

[as] a [part of] Machine, or independently.

63.

said sensor has an operating parameter having magnitude Q;

and in addition said sensor has the Essential Characteristic that

a change in the said magnitude Q of said operating parameter causes a considerable change in the responsiveness of said output V to said interference N

relative to the responsiveness of said output V to said input I, and

said machine also includes support means

to thereby at least one of considerably reduce or practically cancel

the response of said machine output V_c to said interference N

while maintaining a good response to said input quantity I,

thereby considerably improving said machine's accuracy.

10-29-02

64.

acquire an Essential Characteristic type sensor having an output V responsive to said desired input signal I, and also

responsive to said undesired error producing interference N, and further

having an operating parameter of magnitude Q;

show that said Essential Characteristic type sensor has a useful said Essential Characteristic evidenced by

a signal to noise ratio SNR of said sensor observed to change a lot when the

said magnitude Q of said operating parameter is modulated over a practical range;

65.

including said sensor having a strong Essential Characteristic, and also an output V responsive to a physical quantity input I, the gain g given by

$$g \equiv \frac{\delta V}{\delta I}, \text{ and}$$

said output V also responsive to an undesired error producing interference N,

the sensitivity Ψ being

$$\Psi \equiv \frac{\delta V}{\delta N}, \text{ and}$$

said sensor also having an operating parameter of magnitude Q which modulates said Ψ, and to a lesser extent said g;

said sensor having been shown by at least one of calibration, proven manufacturing process, or other demonstration to have said strong said Essential Characteristic, i.e., the said sensitivity Ψ changes a lot more than said gain g when said magnitude Q is driven over a practical range of values; and

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66.

at least one of calibrate, or make by a proven process, or otherwise assure that said sensor has a strong Essential Characteristic evidenced by observing that said Sensitivity Ψ changes a lot more than said gain g when said magnitude Q is driven over a practical range of values;

and at least one of:

provide an error reducing form of said implement, fitted to support said sensor, and

also fitted to drive said magnitude Q and hold it at a constant value, and by at least one of measurement or a proven process, set said magnitude Q at a value corresponding to a said sensitivity Ψ which is a lot less than heretofore while said gain g is still good,
thus making said sensor with implement substantially more accurate than comparable transducers for said input I in the presence of said interference N;
or;

provide an error correction form of said implement having an output V_c, and
also fitted to support said sensor, and
further equipped with state means

driving said magnitude Q,

dividing the said output V, and

combining the said output V, and

wherein said combining is coupled to said implement output V_c;

construct the said state means so that there is at least one state "A" wherein

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said means drive said magnitude Q to produce a large said sensitivity Ψ with good said gain g, and also said sensor output V is largely said divided and made available for said combining;

further construct said state means so that there is also at least one state "ß" wherein

said means drive said magnitude Q to produce a small said sensitivity Ψ with good said gain g, and
also said sensor output V is but slightly said divided and made available for said combining;

to get said error correction, at least one of:

set by a proven process, or adjust at least one of a said means dividing or said means combining so that

the said largely divided said large Ψ of said state "A" is about equal to and opposite from the said but slightly divided said small Ψ of said state "ß", and

thereby the said Ψ's approximately cancel in said combiner so that
the said error producing interference N is mostly removed from said output V_c; and

not withstanding there is remaining at said V_c a large part of said responsiveness to said physical quantity input I;

so that thereby said sensor with implement is a whole lot more accurate than comparable transducers for said physical quantity input I in the presence of said interference N.

The above excerpts from the generic claims include structure needed to achieve noise reduction which is not included in my 1973 patent. For example:

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Essential Characteristic

I did a lot of theoretical and experimental work before writing my 1970 application. I did not see the essential characteristic nor did I make the discovery leading to control of SNR until 1995. It is not even inferred in my 1970 application. Therefore there was no 1970 provision for its use.

To improve the accuracy of our clamp-on DC ammeter in the presence of a non-uniform magnetic field you have to know that you have a good Essential Characteristic, and then provide structure to use it effectively.

Structure present in generic claims 45, 63, 64, and 66 and absent in my 1973 patent includes:

Means enabling said sensor to substantially increase said SNR....

Support means to thereby at least one of considerably reduce or practically cancel... said interference N...

Essential Characteristic type sensor....

shown useful

Calibrate or make by a proven process...

Sensor has a strong Essential Characteristic

Implement fitted to support said sensor

Set said magnitude Q at a value corresponding to a said sensitivity Ψ which is a lot less.

Equipped with state means... state A... state B....

Drive said magnitude Q...

Combining the said output V

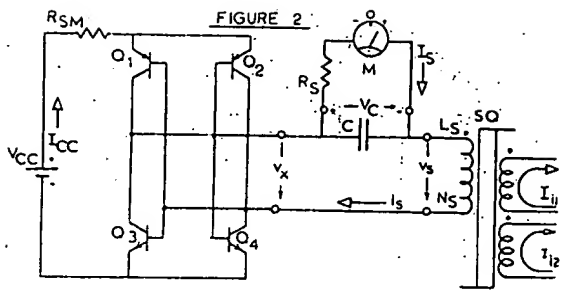
Set... or adjust... Ψ's approximately cancel...

Sensor with implement is a whole lot more accurate.

Summary

That the present invention is not anticipated by my 1973 patent is evident when you compare the 1973 figure 2 and the 1995 figure 11. The present claims provide detail, especially the generic claims discussed above.

Swain 1970



Swain 1995

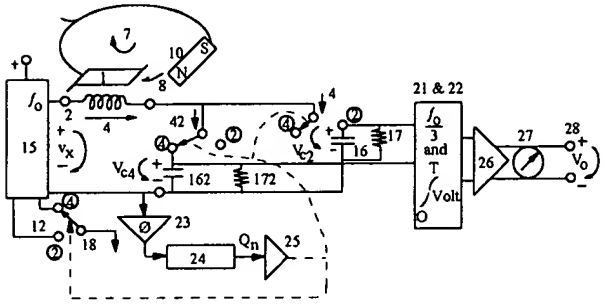


Fig. 11: A simpler implementation of the method defined in Eq. i).

Conclusion

Swain 1970 lacks the basic concept of Swain 1995. Swain 1970 lacks the structure of Swain 1995. Therefore Swain 1970 does not anticipate Swain 1995.

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5. Lee, Moser, Hubbard, and Sweeny are neither pertinent nor analogous. Swain 1970 lacks teaching and structure in Swain 1995.

In his action mailed 9-25-02 the examiner writes:

> 5. Claims 32-66 are rejected under 35 U.S.C. 102(b) as being fully anticipated by any one or Lee, Moser et al, Hubbard, Sweeny or Swain.

Lee, Moser et al, Hubbard and Sweeny do not fully anticipate Swain 1995. They are considered as a group. Swain 1970 is considered in a following section.

5.1 Lee, Moser et al, Hubbard and Sweeny

Nonanalogous

MPEP 2141.01(a) states:

> **2141.01(a) Analogous and Nonanalogous Art [R-1]**
>
> >TO RELY ON A REFERENCE UNDER 35 U.S.C. 103, IT MUST BE ANALOGOUS PRIOR ART
>
> The examiner must determine what is "analogous prior art" for the purpose of analyzing the obviousness of the subject matter at issue. "In order to rely on a reference as a basis for rejection of an applicant's invention, the reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned." *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443, 1445 (Fed. Cir. 1992). See also *In re Deminski*, 796 F.2d 436, 230 USPQ 313 (Fed. Cir. 1986); *In re Clay*, 966 F.2d 656, 659, 23 USPQ2d 1058, 1060-61 (Fed. Cir. 1992) ("A

Lee worked to better control power to a locomotive

Sweeny worked to better control power to a motor.

Hubbard worked to better switch telephone circuits.

Moser et al worked to better control the volume of a radio.

Not one mentioned or inferred sensor or error correction, much less Swain's work to better measure direct current with a clamp-on ammeter. These four references are nonanalogous.

Therefore they cannot be relied upon in rejecting my claims.

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The four references differ from the present invention in both structure and function. "Control" and "Switch" are "nonanalogous" functionally to "measure" and "error correction".

"Control" and "Switch" are not "pertinent" to "error correction" by "selective modulation".

"Control" and "Switch" are not "pertinent" to "find or construct a sensor which has a signal to noise ratio SNR which changes a lot when its operating parameter is selectively modulated..."

Structures are different. Swain 1995 teaches a "clamp-on sensor":

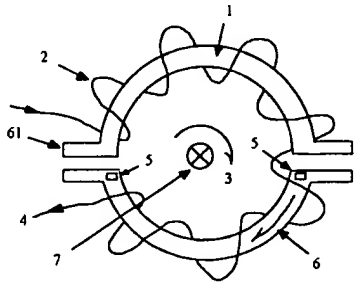

Fig. 1: A clamp-on sensor

My 1995 figure 11 is a preferred embodiment of the combiner species for correcting error in the sensor's output due to the magnet 10 unavoidably present near input current 7.

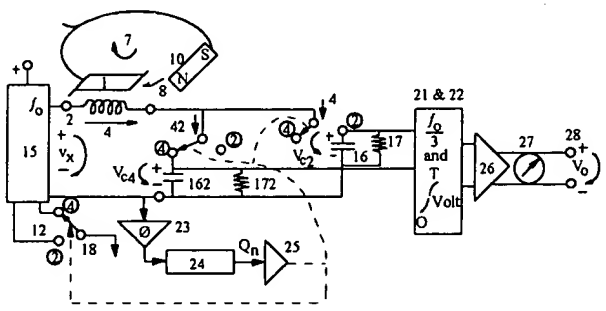

Fig. 11: A simpler implementation of the method defined in Eq. i).

In contrast, Sweeny and the others have

No sensor,
No operating parameter,
No Essential Characteristic, and
No clamp-on sensor.

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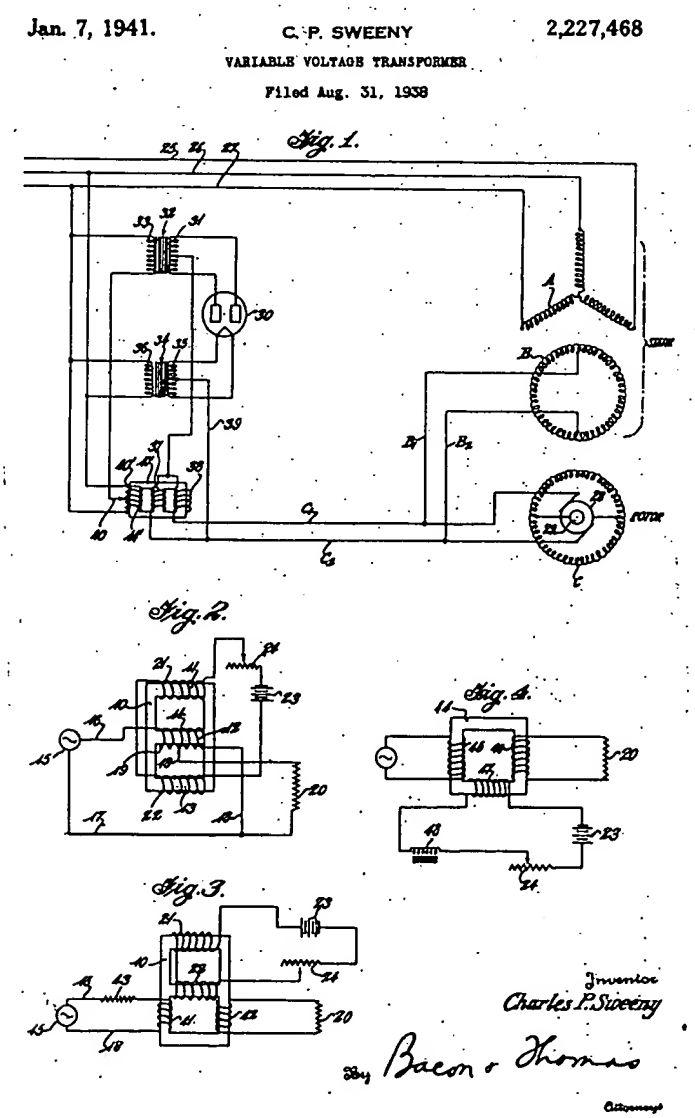
MPEP 2141.01(a) continues:

PTO CLASSIFICATION IS SOME EVIDENCE OF ANALOGY, BUT SIMILARITIES AND DIFFERENCES IN STRUCTURE AND FUNCTION CARRY MORE WEIGHT

While Patent Office classification of references and the cross-references in the official search notes are some evidence of "nonanalogy" or "analogy" respectively, the court has found "the similarities and differences in structure and function of the inventions to carry far greater weight." *In re Ellis*, 476 F.2d 1370, 177 USPQ 526, [illegible]; *In re Clay*, 966 F.2d 656, 23 USPQ2d 1058 (Fed. Cir. 1992) (Claims were directed to a process for storing a refined liquid hydrocarbon product in a storage tank having a dead volume between the tank bottom and its outlet port wherein a gelled solution filled the tank's dead volume to prevent loss of stored product while preventing contamination. One of the references relied upon disclosed a process for reducing the permeability of natural underground hydrocarbon bearing formations using a gel similar to that of applicant to improve oil production. The court disagreed with the PTO's argument that the reference and claimed inventions were part of the same endeavor, "maximizing withdrawal of petroleum stored in petroleum reserves," and found that the inventions involved different fields of endeavor since the reference taught the use of the gel in a different structure for a different purpose under different temperature and pressure conditions, and since the application related to storage of liquid hydrocarbons rather than extraction of crude petroleum. The court also found the reference was not reasonably pertinent to the problem with which the inventor was concerned because a person having ordinary skill in the art would not reasonably have expected to solve the problem of dead volume in tanks for refined petroleum by considering a reference dealing with plugging underground formation anomalies.).

Sweeny and the others are nonanalogous and not pertinent. Therefore they do not anticipate Swain 1995.



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Sweeny and the others have entirely different structure and function so paraphrasing MPEP 2141.01(a) they are:

"not reasonably pertinent to the problem with which the inventor was concerned"
(error correction)
"because a person having ordinary skill in the art would not reasonably have expected to solve the problem of..."
"(zero offset error due to magnetic interference)"
"by considering a reference dealing with..."
(motor speed control)
(control of power to a locomotive)
(switching telephone circuits)
(control of the volume of a radio)

MPEP 2141.01(a) continues: ANALOGY IN THE MECHANICAL ARTS

> See, for example, *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992) (Applicant claimed an improvement in a hose clamp which differed from the prior art in the presence of a preassembly "hook" which maintained the preassembly condition of the clamp and disengaged automatically when the clamp was tightened. The Board relied upon a reference which disclosed a hook and eye fastener for use in garments, reasoning that all hooking problems are analogous. The court held the reference was not within the field of applicant's endeavor, and was not reasonably pertinent to the particular problem with which the inventor was concerned because it had not been shown that a person of ordinary skill, seeking to solve a problem of fastening a hose clamp, would reasonably be expected or motivated to look to fasteners for garments. The Commissioner further argued in the brief on appeal that a disengageable catch is a common everyday mechanical concept, however the court held that the Commissioner did not explain why a "catch" of unstated structure is such a concept, and why it would have made the claimed invention obvious.).

From this we see that a reference needs to be "within the field of applicant's endeavor."

Swain in 1995 would not seek to learn about "constructing a sensor which has a signal to noise ratio SNR which changes a lot when its operating parameter is selectively modulated..."

by considering a reference dealing with:

motor speed control,
control of locomotive power,

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switching telephone circuits, or
control of the volume of a radio.

In 1970 swain Started with:

[54] **MEANS FOR MEASURING MAGNITUDE AND DIRECTION OF A DIRECT CURRENT OR PERMANENT MAGNET, INCLUDING CLIP-ON DIRECT CURRENT SENSING INDUCTOR**

[76] Inventor: **William H. Swain**, 4662 Gleason Ave., Sarasota County, Fla. 33581

[22] Filed: **June 9, 1970**

[21] Appl. No.: **44,761**

Patent 3,768,011

In 1995 Swain improved on his 1970 work with:

(a) Title: Error Correction by Selective Modulation

(c) Reference: U.S. Pat 3,768,011 granted to William H. Swain

(d) Summary.

This invention relates to sensors and/or implements for measurement or control.

The object of the invention is to improve accuracy by reducing error in the sensors output when in the presence of an interfering noise source.

The method used is usually to find or construct a sensor which has a signal to noise ratio SNR which changes a lot when its operating parameter is selectively modulated - - - .

Swain 1970 did not teach or show structure present in Swain 1995, including:

Error Correction by Selective Modulation of an
Operating Parameter which causes a sensor to change its
SNR a lot, plus means for using this to
Improve accuracy in the presence of an interfering noise.

The Swain 1970 does not anticipate Swain 1995.

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5. Anticipation is not shown.

Each of the five cited references is considered in what follows.

Present generic claims 45, 63, 64, and 66, and moreover, all claims 32-66, are not anticipated by any or all of the cited references as is required for rejection under 35 U.S.C.102(b).

MPEP 706.02(a) states:

DISTINCTION BETWEEN 35 U.S.C. 102 AND 103

> The distinction between rejections based on 35 U.S.C. 102 and those based on 35 U.S.C. 103 should be kept in mind. Under the former, the claim is anticipated by the reference. No question of obviousness is present. In other words, for anticipation under 35 U.S.C. 102, the reference must teach every aspect of the claimed invention either explicitly or impliedly. Any feature not directly taught must be inherently present. Whereas, in a rejection based on 35 U.S.C. 103, the reference teachings must somehow be modified in order to meet the claims. The modification must be one which would have been obvious to one of ordinary skill in the art at the time the invention was made. See MPEP § 2131 – § 2146 for guidance on patentability determinations under 35 U.S.C. 102 and 103.

Lee, Moser, Hubbard, Sweeny, and Swain 1970 do not teach every aspect of claims 32 thru 66. Not singly, not in unison, not if modified according to the teaching in the reference. Each is considered separately.

Lee

Mr. Frederick W. Lee filed Oct. 30, 1926 for his Electrical Translating Apparatus, Patent #1,797,268. The following excerpts show the nature of his teaching for controlling the power from the tracks to a locomotive.

March 24, 1931. F. W. LEE 1,797,268

ELECTRICAL TRANSLATING APPARATUS

Original Filed Oct. 30, 1926

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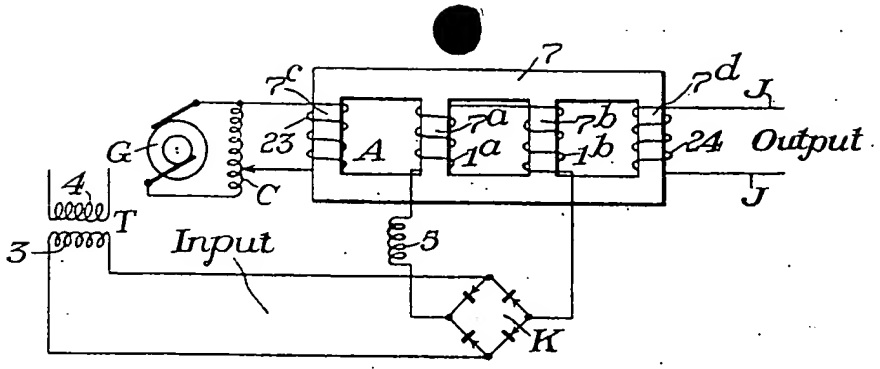

Referring to the drawing, the reference character A designates a reactor having a ladder shaped magnetizable core 7 provided with two outer cross bars 7^c and 7^d, and two inner cross bars 7^a and 7^b. The outer cross bar 7^c is provided with a winding 23, and alternating current is supplied to this winding from a source which is here shown as an auto transformer C having its primary terminals connected with an alternator G.

spondingly large voltage. It follows that for small values of input energy the output current is small, but that with large values of input energy the variation in magnetic coupling between windings 23 and 24 produces a larger output current. The actual variation in the output current may be many times the variation in the input energy, the actual value of the output energy being dependent upon the design and proportions of the various parts.

Apparatus embodying my invention is particularly suitable for use in automatic train control systems of the continuous inductive type. In systems of this character, the secondary 3 of the transformer T, which supplies the input circuit, would ordinarily be carried on the locomotive, and the track rails would ordinarily constitute the primary 4 of this transformer. The output circuit J may supply current to an electro-responsive

Lee uses a ladder shaped core with 4 legs. Lee is not analogous or pertinent to Swain's clamp-on DC ammeter.

The 4 leg core is not suitable for a clamp-on DC Ammeter.

Moreover, Lee uses direct current to control alternating current. Lee does not mention "error correction", "measure", "sensor", or "increased SNR". He offers no "expectation of success" for making "an improved sensor" with less "zero offset" to better measure DC.

There is no motivation to look to Lee for ideas on how to better measure DC.

MPEP 2142 states that motivation is needed to combine references.

ESTABLISHING A *PRIMA FACIE* CASE OF OBVIOUSNESS

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). See MPEP § 2143 – § 2143.03 for decisions pertinent to each of these criteria.

When the motivation to combine the teachings of the references is not immediately apparent, it is the duty of the examiner to explain why the combination of the teachings is proper. *Ex parte Skinner*, 2 USPQ2d 1788 (Bd. Pat. App. & Inter. 1986). A statement of a rejection

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Lee does not anticipate Swain because Lee does:

not show the method or elements of Swain;
not teach the structure of Swain;
not suggest a useful modification of Swain;
not provide a reasonable expectation of success for Swain if Lee's teaching is used;
not teach or suggest all the claim limitations of any of Swain's generic claims 45, 63, 64, and 66. For example, Lee lacks the teaching and structure of Swain 1995 in his claim 66:

A more accurate sensor,
an operating parameter which modulates said sensor
Essential Characteristic
Implement substantially more accurate.

Moser, et al

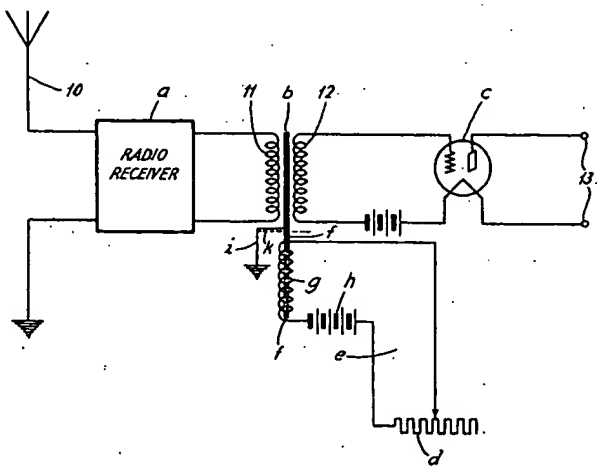
Wilhelm Moser and Hans Dansel teach a way to "...Control the output volume of a radio receiver..." No mention is made of:

sensor
error correction
measure
increased SNR

Moser is not analogous; and he is not pertinent to Swain 1995.

Moser uses direct current (battery h, resistor d) in winding g to control the output 13. In contrast, the emphasis of the present invention is to measure direct current more accurately.

June 29, 1937. W. MOSER ET AL 2,085,440
VOLUME CONTROL DEVICE
Filed Oct. 16, 1935



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It is often desirable to control the output volume of a radio receiver from a point located at some distance from the receiver. This is especially true in using receivers in airplanes, automobiles and other situations where it is desirable that the receiver be located in an inaccessible place in order to conserve space. It is accordingly an object of our invention to provide such a volume control which is simple in construction and operation and inexpensive to install.

It is a further object of the invention to provide a volume control in connection with a transformer which feeds into an audio frequency amplifier and in which a separate winding is provided about a portion of the transformer core, provision being made for passing a direct current through this winding and controlling the direct current by a variable resistor mounted near the receiver or at a location removed therefrom.

operator. When located at a point remote from the receiver the resistor is connected to the battery and winding g by a pair of long leads e.

An advantage of the arrangement is that the line e may have any desired length without detriment to the operating performance of the receiver. In this connection we preferably provide a ground connection i to the transformer core and (or) to provide a grounded static shield K between winding g and the transformer windings. Also, in accordance with the invention, the voltage source h may also be used as the source of filament and plate current of the amplifier tubes.

Having described our invention, what we claim as novel and desire to secure by Letters Patent is:

1. In a volume control device, the combination of a transformer having a core of magnetic material and primary and secondary windings, a third winding inductively coupled to said core, means

Moser offers no "expectation of success" in making "an improved sensor" in the context of the present invention.

MPEP 2143.02 states:

AT LEAST SOME DEGREE OF PREDICTABILITY IS REQUIRED; APPLICANTS MAY PRESENT EVIDENCE SHOWING THERE WAS NO REASONABLE EXPECTATION OF SUCCESS

Obviousness does not require absolute predictability, however, at least some degree of predictability is required. Evidence showing there was no reasonable expectation of success may support a conclusion of nonobviousness. *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976) (Claims directed to a method for the com-

Moreover, Swain's structure is lacking. Moser does not have elements of claim 64: Moser
lacks a more accurate implement for measuring;
lacks an essential characteristic type sensor;
lacks an operating parameter Q;
lacks a sensor with an SNR which changes a lot when the magnitude of said operating parameter is modulated over a practical range.

Moser et al do not anticipate Swain because Moser does:
not show the method or elements of Swain;
not teach the structure of Swain;
not suggest a useful modification of Swain;
not provide a reasonable expectation of success for Swain if Moser's teaching is used;
not teach or suggest all the claim limitations of any of Swain's generic claims 45, 63, 64, and 66, or for that matter, any of claims 32-66.

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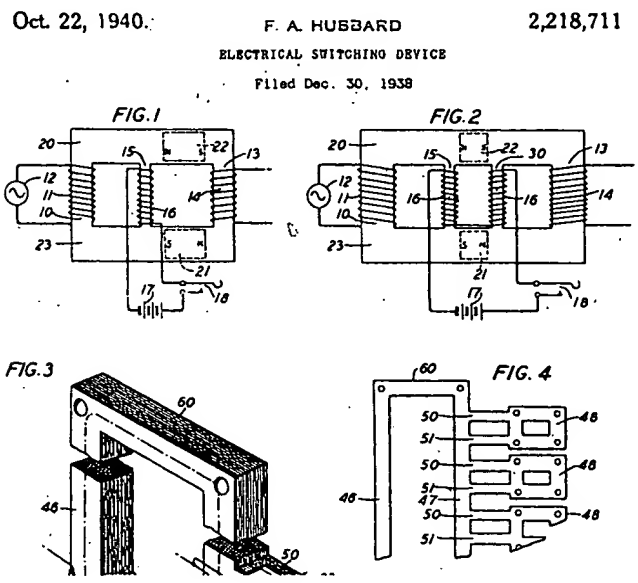
Hubbard

As with Sweeny, Lee, Moser, and Swain, Mr. Francis A. Hubbard offers no reasonable expectation of success in making an "improved sensor" with which to "substantially increase said SNR". Hubbard is not analogous, nor is he pertinent to Swain 1995.

Hubbard teaches a core having at least 3 legs used for switching alternating current telephone circuits using direct current. He does not measure anything. He uses direct current to switch alternating current telephone lines from one circuit to another.



This invention relates to electrical switching and particularly to alternating-current circuit controlling devices whose switching functions are performed inductively, thus obviating the need for circuit controlling contacts.

It is the object of this invention to provide an improved circuit controller of the type which functions to effectively control circuits without the use of circuit controlling contacts.

This object is attained in accordance with a feature of the invention by utilizing, in a circuit controller, a magnetic core structure of permalloy or similar alloy, which can be readily saturated by a steady field and which, when so saturated, becomes virtually non-magnetic to an alternating magnetomotive force of moderate intensity.

Another feature of the invention resides in the use of small permanent magnets embedded in the magnetic core which serve to normally saturate the core structure at particular points in the magnetic circuit, thereby effectively magnetically isolating those portions of the core which are separated from each other by the permanent magnets. By this arrangement a normal condition of substantial electrical uncoupling is maintained between input and output coils carried on separate legs of the magnetic core, which condition may be altered to effectively couple the input and output coils by passing direct current through a control winding carried by an intermediate leg of the core structure in such an amount as to saturate it and in the proper direction to oppose the saturating flux generated by the permanent magnets.

Hubbard shows no motive to include his teaching of a switch in Swain's more accurate sensor.

Moreover, Swain's structure is lacking. Moser does not have elements of claim 65: Hubbard
lacks a more accurate sensor with implement for measuring;
lacks a sensor with a strong essential characteristic;
lacks an operating parameter of magnitude Q;
lacks an error reduction form of said implement, filled to support said sensor.

Hubbard does not anticipate swain because Hubbard does:
not show the method or elements of Swain;
not teach the structure of Swain;
not suggest a useful modification of Swain;
not provide a reasonable expectation of success for Swain if Hubbard's teaching is used;
not teach or suggest all the claim limitations of any of Swain's generic claims 45, 63, 64, and 66.

As with Sweeny, Lee, Moser, and Swain there is no motivation to modify the reference or combine teachings. The cited references do not anticipate Swain 1995.

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Sweeny

Charles P. Sweeny teaches a motor speed control. And not one word is written about "error correction" or "measurement". Instead he speaks of a polyphase source of AC power, a variable voltage transformer, and controlling the speed of a motor. Excerpts are shown below.

Jan. 7, 1941. C. P. SWEENY 2,227,468

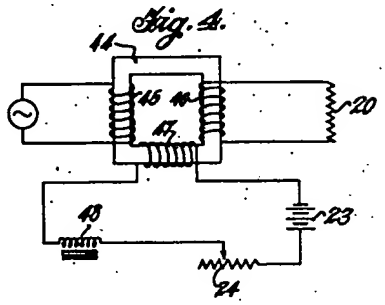
VARIABLE VOLTAGE TRANSFORMER

Filed Aug. 31, 1938

Page 2

A still further modification of the variable voltage transformer is shown in Fig. 4. In this figure a conventional transformer 44 is shown upon which relatively widely spaced primary and secondary windings 45 and 46, respectively, are positioned. A single control winding 47 is shown for varying the saturation of the core 44. It will be noted that the alternating current flux in the core 44 will induce voltages in the control winding 47 such that the transformer of Fig. 4 is not suitable for use where alternating current voltages in the control circuit would be deleterious.

Fig. 4.



Page 3

Alternating currents in the control circuit can, however, be largely eliminated by employing a large inductance 48 in the control circuit.

Variable voltage transformers and systems herein described are capable of general application and may be employed wherever it is desired to vary an alternating current effective voltage in response to amount of current or frequency of current flowing within the control circuit. It will be appreciated that the present systems may be applied to polyphase circuits as well as single phase circuits. The systems herein disclosed are distinguished from conventional reactor circuits particularly in the fact that the effective voltage across the load is decreased with increase of control current, whereas in reactor circuits the effective voltage across the load is increased with increase of control current.

Present claim 45 is for an improved sensor (for measuring) a physical quantity with substantially increased signal to noise ratio (SNR). A preferred embodiment of the combiner species is my 1995 figure 11.

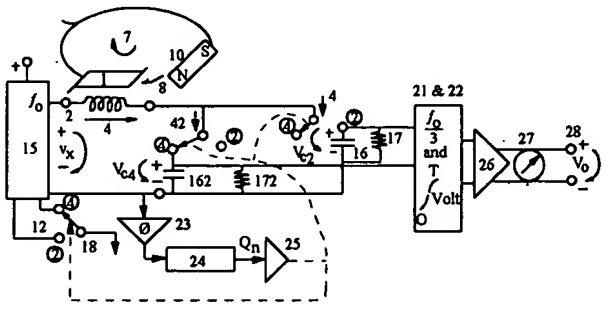


Fig. 11: A simpler implementation of the method defined in Eq. i).

These are entirely different devices. Sweeny is not analogous. He is not pertinent. For example, Sweeny does not teach:

how to correct error,
how to measure, or
how to improve signal to noise ratio

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Sweeny does not show elements in present claim 45:

a sensor,
constructed to have the Essential Characteristic,
an operating parameter Q
means enabling said sensor to substantially increase said SNR in at least one of a machine, or independently.

Sweeny does not teach elements of claim 63:

a more accurate machine for at least one of measuring or controlling,
error producing interference N
a sensor
Said sensor has the essential characteristic that a change in said magnitude Q of said operating parameter causes a considerable change in the response of said output V to said interference N relative to the responsiveness of said output V to said input I,

support means.

Thereby considerably improving said machine's accuracy.

MPEP 2131 Anticipation

This section speaks of 35 U.S.C. 102(a), (b), and (e). It says:

> TO ANTICIPATE A CLAIM, THE REFERENCE MUST TEACH EVERY ELEMENT OF THE CLAIM
>
> "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). The elements must be arranged as required by the claim, but this is not an *ipsissimis verbis* test, i.e. identity of terminology is not required. *In re Bond*, 15 USPQ2d 1566 (Fed. Cir. 1990). Note that, in some circumstances, it is permissible to use multiple references in a 35 U.S.C. 102 rejection. See MPEP § 2131.01.<

The following shows that rejection based in whole or in part on Sweeny is improper.

Sweeny does not set forth the elements of Swain 1995. For example:

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Sweeny does not have the elements of claim 63. Sweeny does:

not show a more accurate machine for measuring.
not include a sensor.
not have and operating parameter of magnitude Q for said sensor.
not include the Essential Characteristic in said sensor.
not considerably improve said machine's accuracy.

Sweeny does not anticipate Swain because he does:

not show the method or elements of Swain.
not teach the structure of Swain.
not suggest a useful modification of Swain.
not provide a motive, i.e., a reasonable expectation of success for Swain if Sweeny's teaching is used.
not teach or suggest all the claim limitations of any of Swain's generic claims 45, 63, 64, and 66.

Moreover, the combined teaching of the cited references does not provide all of the elements of claims 45, 63, 64, or 66.

Sweeny shows no motive to include his teaching of a motor control in Swain's error correction by selective modulation so as to get a more accurate sensor.

In the examiner's action, section 5, he writes on line 4:

> Looking at Figure 4 of Sweeny, as an example, winding 45 senses a current applied by the source connected to winding 45."

Sweeny never uses the word "sense". It comes from Swain 1995. Winding 45 is directly connected to an AC voltage source of power for running a motor.

Further, a worker of ordinary skill in the art would NOT be motivated into "...looking at figure 4 of Sweeny, as an example..." if the worker needed to build an improved Sensor with error correction for Measuring with substantially increased SNR.

Sweeny built a device to control the speed of a motor. It is not analogous. It is not pertinent to Swain 1995.

Sweeny never mentions or infers:

measure
error correction
sensor
increased SNR

These and similar elements are primary in all of the five generic claims 45, 63, 64, , and 66. These in turn rely on the basic concept stated in the "Discovery" and "Essential Characteristic".

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It is this basic concept, not claim 45 alone, which "...determines the fate of all claims..." I think all claims should be considered, especially these 4 generic claims.

Concerning motivation, MPEP 2143 states:

> **2143 Basic Requirements of a *Prima Facie* Case of Obviousness [R-1]**
>
> >To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.
>
> The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).<

These motivational requirements are not met by Sweeny; or for that matter, by Lee, Moser, or Hubbard.

The examiner also writes of Sweeny:

> "Winding 46 responds to the flux in the core 44 and produces a voltage that is applied to resistance 20. If a magnet were placed adjacent the core 44 it would cause undesired interference or "noise"."

But why place a magnet in Sweeny? Sweeny does not suggest it. I expect it will do more harm than good to the operability of Sweeny.

In the context of Sweeny's disclosure, resistance 20 is a motor driven by alternating current power controlled by the variable voltage transformer.

The present invention teaches a more accurate way to measure direct current. In contrast, figure 4 of Sweeny shows a way to use direct current (battery 23, resistor 24, etc.) to control alternating current power to a motor.

Sweeny is not analogous, nor is he pertinent. Sweeny does not teach any part of the present invention.

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Re MPEP 2143, there is no "suggestion" to look at Sweeny. There is no motivation to place a magnet in Sweeny. There is no "expectation of success" if Sweeny's teaching is used.

MPEP 2143.01 states further:

2143.01 Suggestion or Motivation to Modify the References [R−1]

>THE PRIOR ART MUST SUGGEST THE DESIRABILITY OF THE CLAIMED INVENTION

"In determining the propriety of the Patent Office case for obviousness in the first instance, it is necessary to ascertain whether or not the reference teachings would appear to be sufficient for one of ordinary skill in the relevant art having the reference before him to make the proposed substitution, combination, or other modification." *In re Linter*, 458 F.2d 1013, 173 USPQ 560, 562 (CCPA 1972).

The court found there was no suggestion to combine these references to arrive at the claimed invention.

The "suggestion" or "motivation" required by 2143 is lacking in Sweeny. Moreover, it is lacking in the other cited references.

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Swain 1995 is not anticipated by Swain 1970, even when combined with Sweeny.

That Swain 1995 is new - not anticipated by Swain 1970 is shown in detail on pages 24 to 32. The traverse may be summarized as follows:

Swain 1995 claims elements not in or inferred by Swain 1970:
- substantially increase SNR
- operating parameter Q
- Essential Characteristic

35 U.S.C. 112 states that an element of a claim shall be construed to cover the corresponding structure... in the specification. Therefore lines 4-13 of claim 45 add substance. Examples are ratio, and non-linear field Hn in Figure 3.

Also, MPEP 2106 states "...Their claims must be considered as a whole". Lines 4-13 are part of claim 45.

The examiner's proposals for using Sweeny do not anticipate Swain 1995 because:
- Sweeny never mentions SNR
- Sweeny uses winding 47 for control - not to measure.
- If winding 47 were used for bias it would be a signal; not stable; not practical.
- Using winding 47 for bias would make Sweeny inoperative,
  - This is not permitted by MPEP 2143.01.

Sweeny provides no objective reason to combine. See MPEP 2143.01. There is no mention to combine in Sweeny. See MPEP 2143.01.

The examiner is mistaken in asserting that I stated that changing the bias of a saturable core device will change the SNR. He may have misunderstood my Hall Device work with quite different orthogonal fields and reluctance modulation. An example is figure 12.

Even if the combination of the examiner's work and Sweeny and mine could be made useful, which is doubtful, it cannot be used against Swain 1995 because the examiner got the idea and expectation for success from Swain 1995 - not the prior art. See MPEP 2143.

The examiner's suggestion to move a tap on resistor 24 to increase SNR will not work well enough to be useful. It will change both signal gain and noise sensitivity. And even if it did, the expectation of success came from Swain 1995 so cannot be used against Swain. See MPEP 2143.

Sweeny cannot be used against Swain because Sweeny is not pertinent or analogous with Swain 1995. Sweeny controls power to a motor. He does not measure.

And even if the examiner's proposals were workable and allowable, still Sweeny has no teaching of how to use, i.e., operate - a change of SNR to improve the accuracy of

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measurement. The second element of the 2 step process of the basic concept is missing from Sweeny, Swain 1970, and the examiner's proposals.

I conclude that Swain 1995 is not anticipated by the cited references.

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Overall Conclusion

Claims 32-66 should soon be granted. The examiner cited 35 U.S.C. 102(b). It states:

> 35 U.S.C. 102 **Conditions for patentability; novelty and loss of right to patent.**
>
> A person shall be entitled to a patent unless —
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States, or

The invention of Swain 1995 was not patented or described.

The examiner asserted that claims 32-66 were fully anticipated but I have shown that this is not so.

MPEP 706.02(a) states: DISTINCTION BETWEEN 35 U.S.C. 102 AND 103

> The distinction between rejections based on 35 U.S.C. 102 and those based on 35 U.S.C. 103 should be kept in mind. Under the former, the claim is anticipated by the reference. No question of obviousness is present. In other words, for anticipation under 35 U.S.C. 102, the reference must teach every aspect of the claimed invention either explicitly or impliedly. Any feature not directly taught must be inherently present. Whereas, in a rejection based on 35 U.S.C. 103, the reference teachings must somehow be modified in order to meet the claims. The modification must be one which would have been obvious to one of ordinary skill in the art at the time the invention was made.

I have shown that Lee, Moser, Hubbard, Sweeny, or Swain do not teach every aspect of the #32 - #66 claims, especially the generic claims 45, 63, 64, and 66; not by a long shot.

Lee, Moser, Hubbard, Sweeny, and Swain do not teach or imply elements and structure in Swain 95. For example, as in claim 45:

"An improved Sensor...
constructed to have the Essential Characteristic
that the signal to noise ratio SNR is
substantially altered by selective modulation

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of an operating parameter Q, and
means enabling said sensor to
substantially increase said SNR...

Nor do they teach or imply, for further example, elements and structure in claim 63:

a more accurate machine...
interference N...
including a sensor... has...
output V...
input I...
and operating parameter having magnitude Q...
said sensor has the Essential Characteristic that
a change in the said magnitude Q...
causes a considerable change in the responsiveness
of said output V to said interference N
relative to the responsiveness of said output V
to said input I...
support means...
thereby considerably improving said machine's accuracy.

The cited references fail to teach or imply every aspect of the claims, singly, or in combination.

In fact, the cited references do not anticipate Swain 1995. Lee, Moser, Hubbard, and Sweeny are not analogous. And they are not pertinent. They teach control or switching, not a sensor, They, and Swain 1970, never mention or imply aspects of Swain 1995:

Essential Characteristic
substantially increase said SNR
selective modulation
Operating Parameter
thereby considerably improving said machine's accuracy.

Moreover, the cited references do not teach or suggest a combination or modification. Nor do they show a reasonable expectation of success.

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MPEP 2143 states:

ESTABLISHING A *PRIMA FACIE* CASE OF OBVIOUSNESS

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure.

Swain 1995 discovered the source of the long standing problem - zero offset error present when the sensor was near certain sectors of the pipe carrying the current to be measured. It was, and still is, local magnetism creating a non-uniform magnetic field H_n. It was shown in 1995 figure 3.

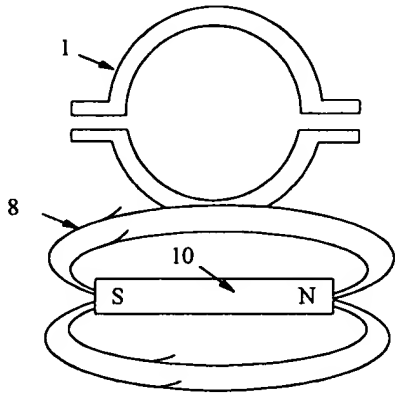

Fig. 3: A non-uniform magnetic field (H_n) 8 from a magnet acting on the core.

By the grace of God, Swain 1995 also found a two step solution. The first step is a well built sensor having the Essential Characteristic of the "Discovery".

DISCOVERY

The inventor discovered that the output V of many Swain Meter clamps was a lot less sensitive (1/2 to 1/3 in some sensors) to a change in the intensity of a non-uniform magnetic field H_n when the magnitude of an operating parameter I_{sm} was doubled or tripled. And the sensitivity (gain) to a change in signal input current I stayed constant to within a few percent.

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The normalized data was converted to signal to noise ratio SNR, and shown in 1995 figure 5:

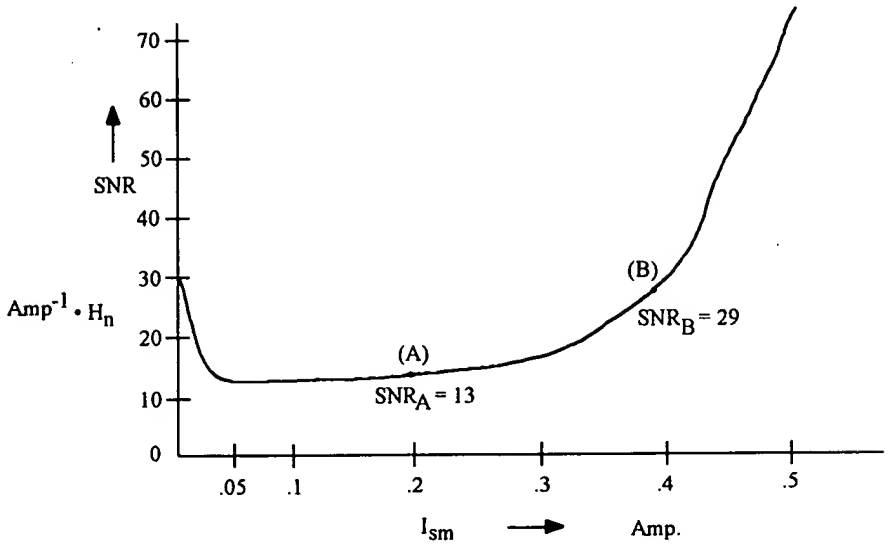

Figure 5
Signal to Noise Ratio (SNR) for Non-Uniform Field H_n
vs.
Operating Parameter I_{sm}
for
5" dia. aperture clip #88 in SN 2336

$$SNR \equiv \frac{\delta V / \delta I}{\delta V / \delta N} \left\{ \frac{\text{output}}{\text{noise}} \right.$$

(output over $\delta V/\delta I$; input over δI)

$$= \frac{\text{gain}}{\text{gain} \cdot \frac{\delta O}{\delta N}} \quad \frac{Z}{g} = \text{equivalent input offset I per unit non-uniform field } H_n$$

The second step was to use the "Discovery" as shown in figure 5 by driving the operating parameter Q (here I_{sm}) at high SNR point (B) - either full time as in the Better SNR species, or sequentially A, then B, then A,... as in the combiner species. With the latter, the noise can be nulled.

The two step method is contrary to the art which had hitherto concentrated on symmetry, etc., in building the sensor. Swain 1970 adjusted I_{sm} upwards only as needed to handle larger input current.

Viewed as a whole, the invention of Swain 1995 has not been patented or described. The claims 32-66 should soon be granted because each involves, in one form or another, the two step basic concept:

a) a good sensor having the Essential Characteristic, and
b) Selective Modulation of the Operating Parameter to get greatly improved signal to noise ratio, SNR.

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